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ABSTRACT

The objectives of this investigation were (1) to study the effects of Minicourse Eighteen, "Teaching Reading as Decoding," upon the development of 27 specific teacher behaviors related to teaching reading decoding skills in a panel of 33 inservice and preservice teachers; and (2) to study the effects of teacher training, or lack of training, with Minicourse Eighteen upon pupil performance in reading. In the study of teacher behavior it was found that the teaching behavior of the sixteen inservice and preservice teachers trained with Minicourse Eighteen changed in the expected direction between pre- and postcourse criterion lessons. Consistent differences were also found between the postcourse teaching behavior of the sixteen teachers trained with Minicourse Eighteen and the seventeen teachers who did not receive the training. The training appeared to be more effective for preservice teachers than for inservice teachers. When the criterion of pupil performance was applied to assess the effects of the training of inservice teachers, it was found that pupils in the classes of teachers trained with Minicourse Eighteen made significantly greater gains in reading achievement over a fourteen week period. (Author)

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TEACHER BEHAVIOR AND PUPIL PERFORMANCE RELATED TO A TRAINING PROGRAM FOR IN-SERVICE AND PRESERVICE TEACHERS BASED UPON MINICOURSE EIGHTEEN: "TEACHING READING AS DECODING"

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June, 1972

THE STATE UNIVERSITY OF NEW YORK AT BUFFALO

CS 000 283

TO

Barbara, Lauren, Kyle and Derek

ABSTRACT

Objectives. The objectives of the investigation were (1) to study the effects of Minicourse Eighteen: "Teaching Reading as Decoding" upon the development of specific teacher behaviors related to teaching reading decoding skills by a group of in-service and preservice teachers; and (2) to study the effects of the teacher training upon pupil performance in reading.

Methods. A non-equivalent control group design was employed to investigate three hypotheses related to teacher behavior, and three hypotheses related to pupil performance. Fourteen in-service teachers of primary grade children from a city in Western New York, and nineteen preservice teachers who were engaged in intern and student teaching experience at the time of the study served as subjects for the research. The treatment--training with Minicourse Eighteen--was assigned to seven in-service and nine preservice teachers. The remaining seventeen in-service and preservice teachers served as the source of control group data for the study of teacher behavior.

All thirty-three teacher subjects taught a twenty to thirty-minute lesson on reading decoding skills to three pupils one week before and two weeks after the training of treatment panel teachers. The pre- and post-course lessons were videotaped and subsequently analyzed, double blind, by eight trained raters to determine the frequency of teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills.

The performance on reading decoding tasks of one hundred and fifteen first, second and third grade pupils in the classes of in-service teachers trained with Minicourse Eighteen was compared, by analysis of covariance, with the performance of an equal number of pupils in the classes of in-service teachers who did not receive the training. Parallel forms of the "Paragraph Meaning" and "Word Study Skills" subtests of the Stanford Achievement Test were administered to second and third grade pupils two weeks before and four weeks after the training of treatment panel teachers. Equivalent forms of the Minicourse Eighteen Achievement Test, a non-standardized test of reading decoding tasks, were administered pre and post to all first, second and third grade pupils (N=230). The test-retest interval was fourteen weeks.

Findings. The t-test for correlated means was employed to compare the pre- and post-course teaching behavior of the sixteen teachers who were trained with Minicourse Eighteen. The mean frequency of treatment panel teachers' use of twenty-four of the twenty-seven behaviors rated increased, or decreased, in the expected direction between the pre- and post-course lessons. The amount of mean change was statistically significant for sixteen of the behaviors.

The teaching behavior of treatment panel in-service and preservice teachers was compared with the teaching behavior of non-treatment panel in-service and preservice teachers by a sequence of multiple partial, point biserial, and multiple point biserial correlation techniques. It was found that the adjusted frequency of teachers' use of twenty-four of the twenty-seven behaviors was associated with the treatment condition.

Comparison of the teaching behavior of in-service teachers

with the teaching behavior of preservice teachers indicated that the training was more effective for preservice teachers, although for both in-service and preservice teachers consistent differences were found between the teaching behavior of treatment and non-treatment panel teachers in their post-course lessons.

When the criterion of pupil performance was applied to assess the effects of the training of in-service teachers, it was found that pupils in the classes of teachers trained with Minicourse Eighteen made significantly greater gains in reading achievement, as measured by the Stanford subtests and the Minicourse test, than pupils in the classes of teachers who did not receive the training. Comparison of the pre- and post-test distributions of treatment panel pupils' grade equivalent scores indicated that less able pupils made greater gains in reading decoding skills than did more able pupils.

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CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS

Aiding children in their acquisition of initial reading skill is unquestionably one of the most important responsibilities of the primary grade teacher. There is, however, ample evidence that many teachers are inadequately prepared to meet this responsibility. Such evidence is indicative of the need for improved methods of training preservice teachers to teach reading, and of the need for the continual up-grading of the skills of in-service teachers.

A proposed contribution to meeting this need, Minicourse Eighteen: "Teaching Reading as Decoding," has recently been developed by the Far West Laboratory for Educational Research and Development. Its purpose is to train teachers in the use of specific teaching behaviors which have been identified through a review of pertinent research as effective in aiding children in the development of skills related to the decoding process of reading.

The value of Minicourse Eighteen as a teacher training device must be determined by the extent to which its use can assist teachers in the development of specific teaching behaviors, and, more importantly, by the extent to which teachers who employ these behaviors are able to facilitate pupil learning and application of decoding skills. The present study was focused upon these questions.

THE PROBLEM

Statement of the Problem

The purpose of this investigation was: (1) to study the effects of Minicourse Eighteen on the development of specific behaviors related to teaching reading decoding skills by a group of in-service and preservice teachers of primary grade children, and (2) to study the effects of the teacher training upon pupil performance in reading.

The effects of the training were studied by:

1. Comparing the pre- and post-course teaching behaviors related to teaching reading decoding skills of a panel of in-service and preservice teachers trained with Minicourse Eighteen.

2. Comparing the teaching behaviors related to teaching reading decoding skills of a panel of preservice teachers trained with Minicourse Eighteen with the teaching behaviors of a similar panel of preservice teachers not trained with Minicourse Eighteen.

3. Comparing the teaching behaviors related to teaching reading decoding skills of a panel of in-service teachers trained with Minicourse Eighteen with the teaching behaviors of a similar panel of in-service teachers not trained with Minicourse Eighteen.

4. Comparing the mean gain in performance on reading subtests of a standardized achievement test of pupils in the classes of a panel of in-service teachers trained with Minicourse Eighteen with the mean gain in performance of pupils in the classes of a panel of in-service teachers not trained with Minicourse Eighteen.

5. Comparing the mean gain in performance on a non-standardized test of reading decoding tasks of pupils in the classes of a panel of in-service teachers trained with Minicourse Eighteen with the mean gain in performance of pupils in the classes of a panel of in-service teachers not trained with Minicourse Eighteen.

6. Comparing the distribution of the pre-test scores with the distribution of the post-test scores on a reading subtest of a standardized achievement test of pupils in the classes of teachers trained with Minicourse Eighteen.

Hypotheses

H_1: The mean frequency of the use of twenty-seven specific behaviors[1] related to teaching reading decoding skills by a panel of in-service and preservice teachers (N=16) trained with Minicourse Eighteen, as derived from the scoring of post-course lesson videotapes, will differ significantly in the expected direction from the mean frequency of these behaviors in the pre-course lesson videotapes.

H_2: The frequency of treatment and non-treatment panel preservice (N=19) teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills in post-course lesson videotapes, adjusted by covariance for differences in the frequency of use of these behaviors in pre-course lesson videotapes, will be correlated in the expected direction to the treatment condition--training with Minicourse Eighteen.

H_3: The frequency of treatment and non-treatment panel in-service (N=14) teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills in the post-course lesson videotapes, adjusted by covariance for differences in the frequency of use of these behaviors in pre-course lesson videotapes, will be correlated in the expected direction to the treatment condition--training with Minicourse Eighteen.

H_4: The covariance adjusted post-test mean grade equivalent scores on the "Word Study Skills" and "Paragraph Meaning" subtest of the Stanford Achievement Test will be significantly greater for second and third grade pupils in the classes of in-service teachers trained with Minicourse Eighteen than the adjusted mean grade equivalent scores of second and third grade pupils in the classes of in-service teachers not trained with Minicourse Eighteen.

H_5: The covariance adjusted post-test mean scores on the reading decoding tasks of the Minicourse Eighteen Achievement Test will be significantly greater for pupils in the classes of in-service teachers trained with Minicourse Eighteen than the adjusted post-test mean scores of pupils in the classes of in-service teachers not trained with Minicourse Eighteen.

H_6: The distribution of post-test scores on the "Word Study Skills" subtest of the Stanford Achievement Test of second and third grade pupils in the classes of in-service teachers trained with Minicourse Eighteen will demonstrate less positive skewness than the distribution of their pre-test scores on the subtest.

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[1] See page 10, and Appendix B.

Significance of the Problem

There is, at present, ample evidence of the need for increasing the effectiveness of teachers in relation to teaching reading. One significant indication of this need is the percentage of children who fail to learn to read adequately in relation to their potential. Statistics describing this problem can be found in numerous sources: for example, former Commissioner of Education, James E. Allen, called attention to the reading problem in his "Right to Read" address when he stated that "one out of every four students, nationwide, has significant reading deficiencies."[2]

The need for increased effectiveness in the teaching of reading has also been identified among the conclusions of the Harvard-Carnegie Reading Studies and the First and Second Grade Cooperative Reading Studies, and by numerous reading educators who have stated this need explicitly. In addition, research studies have continually demonstrated the overwhelming importance of the teacher. Rutherford has concluded that "...pupil success or failure is directly related to teacher effectiveness."[3]

Frequent reference has been made to the need for improved preservice preparation of teachers as a means of increasing their effectiveness in providing reading instruction. The first Harvard-Carnegie study, reported in 1961, dealt specifically with the investigation of under-

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[2]James E. Allen, Jr., "Right to Read: Target for the 70's," Address to the Annual Convention of the National Association of School Boards of Education, September 23, 1969.

[3]William L. Rutherford, "An Analysis of Teacher Effectiveness in Classroom Instruction in Reading," in Nila B. Smith (ed.) Reading Methods and Teacher Improvement. Newark, Delaware: International Reading Association, 1971, p. 124.

graduate teacher preparation in the area of reading. The report of the study strongly indicated the need for improvement in both the quantity and quality of reading methods courses, and pointed to the discrepancy between the theoretical content of such courses and the actual practice of teaching reading.[4]

In a two-year study in which Conant visited thirty-five colleges and universities, he found that only nineteen of the institutions required prospective teachers to take a specific course in the teaching of reading. Although Conant's recommendation that preservice teachers be required to take at least one three semester-hour course in the teaching of reading was stated in terms of quantity of preparation, he also implied that the content and quality of such courses should be up-graded.[5]

The second Harvard-Carnegie study, which was reported in 1963, focused more broadly on the current practices and procedures used in the teaching of reading in elementary schools around the country. Among the recommendations of this study was the following statement: "...the fact that reading instruction in the United States is less effective than it could or should be can be blamed in part on educational factors, notably inferior teaching."[6] Again pointing out the need for improvement in the quality of preservice reading courses, Austin and Morrison noted an "overemphasis on theoretical aspects of reading courses without any

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[4]Mary C. Austin and Coleman Morrison, The Torch Lighters: Tomorrow's Teachers of Reading. Cambridge, Massachusetts: Harvard Graduate School of Education, 1961.

[5]James B. Conant, The Education of American Teachers. New York: McGraw-Hill, 1963.

[6]Mary C. Austin and Coleman Morrison, The First R: The Harvard Report on Reading in the Elementary Schools, New York: Macmillan Company, 1963, p. 234.

corresponding attention to the application of theory in realistic surroundings."[7]

The overemphasis upon theory in college methods courses was also brought out in a recent study by Willis in which he found a reliance upon lecture and discussion techniques in such courses.[8] Appraising reading methods courses, Manning indicated that the overwhelming majority are "textbook oriented, lecture-discussion type offerings." He further pointed out the deductive nature of such courses (students are expected to learn practical applications of techniques through logical deduction from principles of teaching reading presented in lectures).[9] What is apparently overlooked, or perhaps ignored, in such courses is the fact that complex teaching skills, or behaviors, cannot be learned through lecture and discussion alone.

From the available evidence it is clear that traditional college methods courses in the teaching of reading have been less than adequate in preparing teachers for their role in aiding children's reading development. Quite logically, in-service teacher training programs have been suggested as a means of overcoming deficiencies in preservice preparation.

An investigation of in-service programs in reading was included in the second Harvard-Carnegie study. In response to the finding that

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[7] Ibid., p. 236.

[8] D. E. Willis, "Learning and Teaching in Methods Courses, Part I: Current Practice," Journal of Teacher Education. 19:39-46, Spring, 1968.

[9] John C. Manning, "Inductive Concepts of Teacher Education - The Undergraduate Reading Methods Course," Paper presented to the International Reading Association Conference, Boston, April, 1968. (ERIC: ED 026 209)

such programs "commonly evidence weaknesses," Austin and Morrison recommended that "in-service programs be designed to increase the knowledge and to improve the performance of teachers."[10] More recently, Theodore Harris in summarizing research on the teaching of reading recommended that "more effective in-service programs and other means need to be sought to assist teachers in the field to meet effectively the reading instructional needs of students."[11]

Documentation of the need for improved in-service and preservice teacher training has been presented above through specific statements of such need. Further indication of this need comes from the substantial evidence of the importance of the teacher's role in teaching reading, evidence which has been derived from studies focused upon materials, or approaches, used in teaching reading. In noting the "heavy emphasis" upon methods and materials-type research, Heilman stated that:

> Perhaps the inconclusive nature of research findings results from the fact that what the teacher does in the classroom has more impact on pupil growth in reading than does the prescribing or proscribing of instructional materials.[12]

One of the major findings of the Cooperative First Grade Reading Studies, which were largely devoted to the study of methods, or approaches, for teaching beginning reading, was that within a given approach, teachers employing the same materials produced different results. This finding led Bond and Dykstra to conclude that:

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[10] Austin and Morrison, op. cit., p. 237.

[11] Theodore L. Harris, "Reading," in Robert L. Ebel (ed.), Encyclopedia of Educational Research, Fourth edition. London: Collier-Macmillan, 1969, p. 1085.

[12] Arthur W. Heilman, "Effects of an Intensive Inservice Program on Teacher's Classroom Behavior and Pupil Reading Achievement," November, 1965. (ERIC: ED 002 359), p. 2.

> Future research might well center on teacher and learning situation characteristics rather than method and materials. The tremendous range among classrooms within any method points out the importance of elements in the learning situation over and above the methods employed. To improve reading instruction it is necessary to train better teachers of reading rather than to expect a panacea in the form of materials.[13]

In reviewing the results of the Cooperative Reading Studies, Artley,[14] Eller,[15] and Albert Harris[16] cited the above conclusion as one of the most significant contributions of this large-scale research project.

Given the evidence of the crucial role the teacher plays in aiding children's acquisition of reading skills, the need for improved training of teachers at both the in-service and preservice level becomes quite clear. The questions of what improvements should be made in such training, and of how such training should be conducted are less clear. There is little doubt that teachers need to possess knowledge of the reading process in order to teach reading effectively. At the same time there is some evidence that such knowledge alone is not sufficient to ensure effectiveness in teaching reading. Such evidence, it is felt, points to the need for training teachers in the use of specific teaching techniques, or behaviors, which facilitate pupil learning.

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[13] Guy L. Bond and Robert Dykstra, Coordination Center for First Grade Reading Instruction Programs. Final Report, Cooperative Project No. X-001, February, 1967. (ERIC: ED 013 714), p. 211.

[14] A. Sterl Artley, "The Teacher Variable in Teaching Reading," Reading Teacher, 23:239-48, December, 1969.

[15] William Eller, "Contributions of the First and Second Grade Studies," in J. Allen Figurel (ed.), Reading and Realism. Newark, Delaware: International Reading Association, 1969, pp. 585-88.

[16] Albert J. Harris, "The Effective Teacher of Reading," The Reading Teacher, 23:195-204, December, 1969.

The observation has been made that "every way possible needs to be explored to make teachers (of reading) more effective in the classroom."[17] The present study was conceived and conducted as an investigation of a "possible way" of increasing teachers' effectiveness in teaching reading decoding skills. It is hoped that the results reported in this study will provide the potential user of Minicourse Eighteen--and other Minicourses--with information relative to the efficacy of its use as a teacher training device. The inclusion of pupil performance data in the study enables the reader to judge the effects of the training of teachers by its effect upon children's reading ability.

DEFINITION OF TERMS

Decoding. A term generally synonymous with word attack and word analysis. The graphic form of the word represents the "code" for the sound and/or meaning.

Microteaching. A means of developing specific teaching behaviors in which the trainee teaches a short, five to ten minute, lesson based upon well defined objectives to six, or fewer, students. The lesson is videotaped and subsequently replayed for the purpose of analysis. On the basis of the analysis the lesson is replanned and retaught, thus completing a "teach-reteach" cycle.

Minicourse Eighteen: "Teaching Reading as Decoding." An auto-instructional program developed by the Far West Laboratory for Educa-

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[17] Leo Fay, "The Teacher and the Improvement of Reading," in Nila B. Smith (ed.), Reading Methods and Teacher Improvement. Newark, Delaware: International Reading Association, 1971, p. 123.

tional Research and Development and designed to aid teachers in the development and refinement of teaching behaviors which facilitate pupils' acquisition of decoding skills.

Materials included in the experimental version of the program consist of a teacher's handbook, which contains pertinent research and information related to the course content; six, half-hour videotapes which present instructional and model lessons related to teaching reading decoding skills; and diagnostic and instructional aids for teaching decoding skills.

The course consists of five instructional sequences and a review lesson. Within each sequence the trainee reads the appropriate section of the handbook, then views the instructional and model lesson of the sequence. He then plans and conducts a microteaching lesson to practice and refine the specific teacher behaviors dealt with in the sequence. The microteaching lessons are videotaped by the trainee and subsequently replayed for self-analysis purposes; following which the lessons are replanned and retaught to a different group of students, and again analyzed by the trainee.

The above activities are repeated during each of the five instructional sequences of the course.

Perceptual model. A short, filmed or videotaped sequence depicting an interactive teaching-learning situation for the purpose of illustrating a specific teacher behavior.

Specific behaviors related to teaching reading decoding skills. Teacher behaviors identified through a review of research by the Far West Laboratory which are purportedly effective in building children's

ability to employ decoding skills in reading. These behaviors form the instructional content of Minicourse Eighteen. (See Appendix B)

Symbolic model. A detailed written or oral description and rationale for the use of a specific teaching behavior.

Videotaped feedback. Secondary feedback provided to a trainee through the medium of videotape replay of a teaching-learning situation which he has directed.

CHAPTER II

REVIEW OF THE LITERATURE

While there is a considerable volume of research pertaining to the major components of the training model employed in Minicourses, at the time of this writing no research had yet been reported which dealt specifically with the efficacy of Minicourse Eighteen as a training device for increasing teachers' effectiveness in teaching reading decoding skills. Consequently, the hypotheses of this study were derived from research and experience pertaining to previously introduced Minicourses, and from research on the use of microteaching, perceptual and symbolic modeling and videotaped feedback in teacher training. In this chapter the results of this research, and related literature, are summarized.

OVERVIEW

There is general agreement that in order to function effectively as a teacher an individual must possess (1) adequate knowledge of the curricular content, or skill, to be taught; (2) an understanding of the characteristics and needs of the learner; and (3) a repertoire of teaching skills or behaviors which facilitate pupil learning. In both the preparation and certification of teachers, greatest emphasis is placed upon the knowledge and understanding components of teaching, to the almost total exclusion of the teaching skills aspect.

Perhaps the major reason for the deemphasis of the behavioral aspects of teaching has been the lack of concrete evidence as to what constitutes effective teaching. Much of the early research on

teaching sought to identify certain global characteristics, or behaviors, of "effective teachers." The inconclusive nature of such research was illustrated by Berelson and Steiner. Indices of teacher effectiveness were not included in their inventory of scientific findings in the behavioral sciences. They stated that no clear conclusions could be drawn from the large number of studies on teacher characteristics and teacher behavior.[1] A more recent review of teacher behavior research was conducted by Ornstein[2] who also pointed to the lack of agreement as to what constitutes effective teaching.

Gage noted that the inconclusiveness of much of the early research on teaching resulted from the search for global characteristics of effectiveness. He proposed the use of "micro-criteria" of effectiveness:

> One solution within the "criterion of effectiveness" approach may be the development of the notion of "micro-effectiveness." Rather than seek criteria for the over-all effectiveness of teachers in the many, varied facets of their roles, we may have better success with criteria of effectiveness in small specifically defined aspects of the role.[3]

This view of micro-criteria lead to the adoption of the "technical skills" approach to teacher training at Stanford University in the early 1960's. In this approach an attempt was made to identify "specific teaching behaviors that are used in a variety of teaching situa-

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[1]B. Berelson and G. Steiner, Human Behavior: An Inventory of Scientific Findings. New York: Harcourt, Brace and World, 1964, pp. 440-441.

[2]Allen C. Ornstein, "Research on Teacher Behavior, Approaches, Limitations, and Recommendations," 1970. (ERIC: ED 043 564), 54 pp.

[3]N. L. Gage, "Paradigms for Research on Teaching," in N. L. Gage (ed.), Handbook of Research on Teaching. Chicago: Rand-McNally, 1963, p. 120.

tions and are to some degree independent of the subject matter or kinds of students being taught."[4] The initial attempts to divide the teaching process into relatively discrete, identifiable components was accomplished by an intuitive process based on numerous observations of classrooms. Less euphemistically, Cooper and Allen, Stanford staff members, stated that "The first teaching skills were identified in a rather haphazard fashion."[5]

While conceding that the original technical skills identified at Stanford were "arguable," Gage maintained that:

> What is important is the approach - the attempt to analyze teaching into limited, well-defined components that can be taught, practiced, evaluated, predicted, controlled, and understood in a way that has proven to be altogether impossible for teaching viewed in the larger chunks that occur over a period of an hour, a day, a week, or a year.[6]

The technique of microteaching was developed at Stanford in 1963, and subsequently became a means of training prospective teachers (interns) in the use of technical skills of teaching. While many variations of microteaching have been used, as originally designed it consisted of the teacher trainee teaching a short (five to ten minute) lesson to four to six pupils. The lesson was videotaped and evaluated by the pupils who were instructed by the trainee, and by the trainee's supervisor. The lesson was then retaught, videotaped, and again evaluated.

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[4]Robert N. Bush and N. L. Gage, "Center for Research and Development in Teaching," Journal of Research and Development in Education, 1:86-105, Summer, 1968, p. 88.

[5]James M. Cooper and Dwight W. Allen, "Microteaching: History and Present Status," February, 1970. (ERIC: ED 036 471), p. 19.

[6]N. L. Gage, "An Analytical Approach to Research on Instructional Methods," Phi Delta Kappan, 49, June, 1968, p. 602.

Since its inception, many adaptions of the use of microteaching have been reported. Variables such as the conditions of practice, demonstration techniques, and the amount and type of feedback provided the trainee have been manipulated. In addition to its applications in preservice teacher training, microteaching has also been adapted to in-service training.

Borg and the staff of the Teacher Education Program at the Far West Laboratory for Educational Research and Development adopted microteaching as the basic training technique for use in a series of Minicourses designed to improve the effectiveness of classroom teachers. The rationale for the Minicourse is based upon the technical skills approach in that the instructional content of each Minicourse is a set of specific, identifiable teacher behaviors. Minicourses differ from the microteaching-technical skills approach used at Stanford in the respect that they focus upon more specifically defined teaching situations such as tutoring in mathematics or teaching reading decoding skills. Minicourse training also relies upon self-analysis of videotapes, rather than pupil and supervisory feedback.

As originally designed the "Minicourse Instructional Model"[7]--the training paradigm upon which Minicourses are based--included the following major components: (1) symbolic and perceptual modeling of the teacher behavior(s) to be learned; (2) microteaching and reteaching to practice the behaviors; and (3) structured self-analysis of feedback provided by videotapes of the microteach and reteach activities. In addi-

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[7]Walter R. Borg, et al., The Minicourse: A Microteaching Approach to Teacher Education. New York: Macmillan Educational Services, Inc., 1970.

tion, the teacher trainee is provided with specific objectives, stated in behavioral terms.

In the remainder of this chapter research and literature pertaining to the major components of the Minicourse Instructional Model will be examined. The research presented was selected in terms if its applicability to the present study.

MICROTEACHING

Since its inception at Stanford University in 1963, the technique of microteaching has received rather wide application. Despite its apparent wide-spread and growing utilization, very few rigorously designed studies of microteaching have been reported.

In their review of research on microteaching Cooper and Allen stated that "more reliable knowledge about this method of training teachers is needed..."[8] In the absence of such knowledge, the literature is replete with descriptive and testimonial-type reports endorsing the use of microteaching.[9, 10, 11] While such reports are important in defining the direction for future research and application of microteaching, they provide no empirical data.

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[8]Cooper and Allen, op. cit., p. 20.

[9]Alden J. Moe and Sister Mary Dorothy Feehan, "The Use of Videotape Recorders in Training Reading Teachers," April, 1968. (ERIC: ED 022 635)

[10]John H. Meier, "Rationale for and Application of Microtraining to Improve Teaching," Journal of Teacher Education, 19:145-57, Summer, 1968.

[11]Richard D. Biberstine, "The Utilization of Videotape Equipment in Teacher Education," Contemporary Education, 42:217-21, April, 1971.

The most systematic studies of microteaching to date have been conducted by the Stanford Center for Research and Development in Teaching and by the Far West Laboratory. In the remainder of this section studies which have been directed toward assessing the general efficacy of microteaching as a teacher training technique are reviewed.

Much of the early research on microteaching was conducted at Stanford University in conjunction with the Secondary Teacher Education Program. The first such study involved a comparison of two groups of secondary teacher education candidates (interns) who were randomly assigned to either of two training procedures operated concurrently during the summer of 1963: a microteaching clinic or a program which involved observation and teacher aide experience. Lessons conducted by the interns were rated by trained raters at the conclusion of the summer training, and again during the following school year. Reporting on the results of the study, Bush[12] stated that the evaluation of the two groups yielded a higher rating of teacher competence for the microteaching group. Among his conclusions he noted that performance in microteaching accurately predicted subsequent classroom performance.

A microteaching clinic was again held at Stanford in the summer of 1964. And, while the results of the 1963 and 1964 clinics have frequently been reported together, specific results from the 1964 clinic are conspicuously absent from the various research summaries and bibliographies on microteaching.[13, 14] Kallenback, in referring to the 1964 clinic

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[12]Robert N. Bush, "Micro-teaching: Controlled Practice in the Teaching of Teachers," Communication, 48:201-07, July, 1966.

[13]Dwight W. Allen, Micro-Teaching, A Description, September, 1967. (ERIC: ED 019 224)

[14]Dwight W. Allen and James M. Cooper, "Microteaching. PREP - 17," October, 1970. (ERIC: ED 041 190)

reported that there were "no significant differences in judged teacher competence between randomly selected secondary intern teaching candidates (n=30) who had summer student teaching and those who had participated in the micro-teaching program on campus."[15]

Fortune, Cooper and Allen reported a study of the Summer Micro-teaching Clinic held at Stanford in 1965.[16] In this study 140 interns taught a five-minute "diagnostic lesson" on the first day of the clinic, and subsequently taught two, five-minute lessons in a teach-reteach cycle during the next three weeks. Students whom the interns instructed in the lessons were recruited from local junior and senior high schools and were paid for their participation.

During the final three weeks of the clinic, interns were assigned to a team teaching situation and were responsible for preparing and teaching a unit of study in their subject area to a group of high school students. Each intern in the team taught a twenty to twenty-five minute lesson daily for three weeks. Every other lesson was videotaped, although supervisory sessions were held after each lesson. A five minute diagnostic lesson was again taught by each intern at the completion of the summer training.

The Stanford Teacher Competence Appraisal Guide (STCAG) was used as the criterion instrument in rating interns' pre- and post-diagnostic

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[15]Warren Kallenback, "Microteaching as a Teaching Methodology," (from the proceedings of the Conference on Instructional Methods and Teacher Behavior, Berkeley, California, November, 1966). (ERIC: ED 013 791), p. 15.

[16]Jim C. Fortune, James M. Cooper, and Dwight W. Allen, "The Stanford Summer Micro-Teaching Clinic, 1965," Journal of Teacher Education, 18:389-93, Winter, 1967. (Also in ERIC: ED 019 224)

lessons. The interns' teaching performance was rated by the high school students who had been instructed in the lessons, and by the interns' microteaching supervisor. Comparison of the students' rating of the interns' diagnostic lessons showed a significant increase ($p=.01$), pre to post, on nine of the items on the Appraisal Guide. The microteaching supervisors' ratings of the interns also showed a significant ($p=.01$) increase on twelve of the items between the pre- and post-lessons. On the basis of these results, the authors of the report concluded that "the (1965) micro-teaching clinic produced significant behavior changes in teacher education candidates over a six week period."[17]

The nature of the criterion instrument used must be considered in interpreting the results of the above studies. It is important to note that STCAG required the raters (high school students and microteaching supervisors) to judge the "competency" of an intern's teaching performance by responding on a seven point forced-choice scale ranging from "weak" to "truly exceptional," to thirteen items such as "Appropriateness of Aims" and "Teacher-Pupil Rapport." As such, the instrument did not provide specific data about teacher behavior, but instead yielded a rating of competence. The fact that the STCAG "proved to be unsatisfactory" was noted by Cooper, a member of the Stanford staff, when he pointed out that "none of the items on the appraisal guide were specifically designed for any of the technical skills that were the focus of the microteaching clinics."[18]

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[17] Ibid., p. 392.

[18] James M. Cooper, "Developing Specific Teaching Skills Through Microteaching," in Dwight W. Allen, Micro-Teaching, A Description, September, 1967. (ERIC: ED 019 224)

The problem of using the STCAG as the major criterion instrument was recognized by the Stanford staff in their planning for the 1966 Summer Microteaching Clinic. Cooper and Stroud[19] reported that for the 1966 clinic, evaluative instruments were designed to measure interns' progress in each of the technical skills included in the training. However, validity and reliability of these instruments was not established before their use.

In the 1966 clinic, 145 interns taught five-minute pre- and post-diagnostic lessons which were rated by high school students who were instructed in the lessons, and by the interns' microteaching supervisors. In order to test the null hypothesis that there would be no gain in the competency rating of interns, pre to post, the pre-lesson rating was subtracted from the post-lesson rating on eleven items of the STCAG. On the basis of the data analysis, the null hypothesis was rejected at a high level of significance (.00001). However, further analysis indicated a significant effect of rater bias, i.e., the students and the supervisor had a tendency to rate an intern's teaching competence in the same lesson differently. Interestingly, this finding lead the authors to conclude that "student ratings are probably a more accurate measure of behavior change than the supervisor rating."[20]

The utilization of the technical skills evaluative instruments allowed the Stanford staff to study the effects of the number of micro-teach lessons an intern conducted on the rating of his competence in a

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[19] James M. Cooper and Thomas Stroud, "The Stanford Summer Micro-Teaching Clinic, 1966," in Dwight W. Allen, Micro-Teaching, A Description, September, 1967. (ERIC: ED 019 224)

[20] Ibid., p. 20.

given technical skill. It was found that the addition of a second teach-reteach cycle, making a total of four microteach lessons for the practice of a given skill, resulted in higher ratings of competence in that skill. Ratings from the newly developed technical skills evaluative instruments were used as the criterion to measure changes in ratings between the microteach lessons.

The Stanford studies of microteaching cited above utilized secondary teacher interns as subjects. Kallenback and Gall[21] conducted an investigation at San Jose State College in 1966 and 1967 to study the efficacy of using microteaching in the training of elementary school interns. The research design used in their study was similar to those used to study the Stanford Microteaching Clinics, and the same criterion instrument for rating intern's competence, the STCAG, was employed.

Subjects of the San Jose study, thirty-seven preservice elementary teachers, were randomly assigned to either microteaching (N=19) or regular student teaching (N=18). Before the start of the summer training, interns in both groups taught a five-minute diagnostic lesson to a small group of fifth and sixth grade pupils. During the training both groups received the same instruction in the use of the skills of lesson preparation, presentation, and teacher-pupil rapport. And, while both groups were encouraged to use the skills, only the microteaching group was required to prepare and teach short lessons in which the skills would be practiced in a teach-reteach microteaching cycle. The student teaching group engaged in standard observation and practice teaching dur-

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[21]Warren W. Kallenback and Meredith D. Gall, "The Comparative Effects of Micro-teaching and a Conventional Training Program on the Classroom Performance of Elementary Intern Teachers," Journal of Educational Research, 63:136-141, November, 1969.

ing the summer.

Upon the completion of the summer training, each intern again taught a five-minute diagnostic lesson. Videotapes were made of the pre- and post-training diagnostic lessons. Because twenty of the tapes were lost and could not be rated, comparison was made between the STCAG rating of the pre- and post-diagnostic lessons of fourteen interns in the microteaching group and thirteen interns in the student teaching group. These twenty-seven interns were also rated on their teaching competence in an actual classroom situation during the fall (1966) following their summer training, and again the following spring (1967). For the fall and spring ratings both the STCAG and the Instrument for the Observation of Teaching Activities were used.

Analysis of covariance using the pre-summer diagnostic lesson as the covariate, indicated that the microteaching and student teaching groups were not significantly different from each other on either the post-summer, fall or spring ratings of teaching competence. From this finding, the authors concluded that "microteaching is a superior training strategy since it achieves similar results when compared with conventional training methods in only one-fifth of the time."[22] The San Jose study also confirmed the earlier finding at Stanford that ratings of interns' performance in a microteaching situation adequately predicted subsequent classroom performance. On the basis of this finding, Kallenback and Gall stated that "microteaching behavior is not unique to that situation but is representative of the teacher's actual classroom performance."[23]

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[22] Ibid., p. 140.

[23] Ibid., p. 141.

In another investigation of microteaching, Bell conducted a study of its application to the training of home economics teachers at Texas Technological College in 1968. While the actual results of the study were not read by the present author, Cooper and Allen[24] reviewed the study and cited it as "one of the better research studies performed." They state that in Bell's study a control group participated in traditional student teaching only, while the experimental group participated in microteaching training after completing student teaching. It was reported that there was a significant (.01) gain in the teaching performance of the experimental group who recieved the microteaching training. Also, a significant (.01) difference between evaluations of experimental and control group subjects' final lessons was reported. (The criterion measure was not reported in Cooper and Allen's review of Bell's research.)

The studies related to the early applications of microteaching cited above may be viewed as "exploratory" rather than experimental research. As such, these studies were not sufficiently rigorous in design to answer the question of the "effectiveness of microteaching," per se. Indeed, this was probably not their purpose, although these studies are frequently cited as "evidence" of its effectiveness.

Perhaps the greatest contribution of the studies which have been summarized above was that they provided empirical data upon which improvements in the use of microteaching as a teacher training device could be based. The findings of these studies also pointed the direction for subsequent research which focused upon the manipulation of feedback and modeling variables used in conjunction with microteaching.

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[24]James M. Cooper and Dwight W. Allen, "Microteaching: History and Present Status," February, 1970. (ERIC: ED 036 471), pp. 12-13.

Research related to feedback and modeling is reported in the next sections of this chapter.

FEEDBACK

Feedback, a term derived from the study of servo mechanics, is defined as "the partial reversion of the effects of a process to its source."[25] In the application of the term to teacher training, the "process" may be conceived as the teaching-learning situation, while the "source" is the teacher.

The rationale for the use of feedback as a means of changing teacher behavior rests upon a basic tenent of psychology which indicates that both practice and the awareness of the consequences of one's behavior are requisite to the alteration of that behavior. Microteaching as a training paradigm makes major use of both practice and feedback.

Smith[26] described the feedback a teacher receives about his teaching as being either primary or secondary. Primary feedback is recieved by the teacher during the interactive phase of teaching through clues derived from the assessment of pupil's overt and covert reactions and responses. Secondary feedback is received after the teaching, in the post-active phase, and may be provided by the teacher's supervisor, students or colleagues. When mediated through verbal communication only, secondary feedback contains one or more of the following limitations which contribute to its subjectivity: (1) the teacher's perception of

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[25] Webster's Seventh New Collegiate Dictionary, Springfield, Massachusetts: G. and C. Merrian Company, 1965, p. 306.

[26] B. Othanel Smith, Teachers for the Real World, Washington, D. C.: American Association of Colleges for Teacher Education, 1969, p. 78-79.

the teaching situation about which feedback is being received may be quite different from the perception of the person(s) providing the feedback; (2) the teacher may form a defensive reaction to the content or the source of the feedback; (3) the value of the feedback is limited by the teacher's capacity to objectively reconstruct the teaching situation through visual imagery.

Videotape recording has recently become a feasible means of reducing the subjectivity of secondary feedback provided to the teacher. When a teacher views a videotape recording of a teaching-learning situation which he has directed he recieves perhaps the most objective type of secondary feedback which present technology permits. Although it is certainly possible for a teacher, while viewing a videotaped lesson replay, to fail to perceive the consequences of his teaching behavior, or to internally deny what he is seeing, there is a considerable amount of research which suggests that when videotape feedback is provided under certain conditions it is a valuable device for teacher training. The focus of such research has been upon the specific conditions under which the trainee views the lesson replay, and upon his activities during viewing.

Several studies have indicated the need for providing the teacher trainee with some specific purpose, or focus, for his viewing. And, while supervisors have most frequently been used to provide such focus, there is increasing indication that the trainee's use of self-analysis checklists and observation scales, which he completes while viewing a videotape of a lesson which he has conducted, can result in equal, if not superior, behavioral changes.

One of the first studies of the effects of videotape feedback on

teacher behavior was conducted by Acheson[27] at Stanford in 1964. In addition to testing the feasibility of this method of feedback, Acheson sought to determine the effects of viewing videotape replays on the decrease of teacher monologue (lecturing), and on the frequency of teacher-pupil, and pupil-pupil, verbal transactions. Forty-eight secondary teacher interns were randomly assigned to one of six levels of treatment. Half of the total group viewed videotape replays of three lessons which they had conducted, while the other half did not. Within the viewing and non-viewing groups three types of supervision were provided: "direct" supervisory conferences, "indirect" supervisory confeences, and no supervisory conferences.

Systematic observation of the interns' lesson videotapes and subsequent data analysis indicated that the two groups who viewed videotape replays in conjunction with direct or indirect supervisory conferences showed significantly greater (.05) decreases in lecturing than did the two groups who received supervisory conferences but did not view videotapes of their teaching. Interns who viewed replays of their lessons and received supervisory conferences showed greater decreases in lecturing than interns who viewed replays but received no conferences. Acheson's data also showed that the decrease in lecturing of interns who received supervisory conferences only (no viewing) was not significantly greater than interns who viewed lesson replays but received no supervisory conferences. No significant differences were found between the six treatments in the frequency of verbal transactions.

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[27] Keith Alan Acheson, "The Effects of Feedback From Television Recording and Three Types of Supervisory Treatment on Selected Teacher Behaviors," Unpublished Doctoral Dissertation, Stanford University, 1964, Dissertation Abstracts, 25:6-8, p. 3986.

Two conclusions of importance to the present study can be drawn from Acheson's research: that supervisory feedback alone was not found to be superior to self-analysis of videotapes; and, that supervisory conferences in conjunction with viedotaped lesson replays produced superior results. When these conclusions are combined with the findings of subsequent research, it appears quite probable that the superior gains of the groups who received supervisory conferences in conjunction with the viewing of videotapes was a result of the supervisor having directed the trainee to observe specific aspects of his own teaching. Cooper and Stroud, in summarizing the results of the 1966 Summer Microteaching Clinic at Stanford, provided some support for this hypothesis when they observed that "the most ineffective use of the video-tape is to replay the entire lesson and just sit and watch it. The supervisor needs to point out specific things (not more than one or two) on which he wants the intern to focus."[28]

Another early study of videotape feedback, which tended to corroborate Acheson's findings, was conducted by Olivero[29] in 1964. While Olivero's study was designed to determine the efficacy of substituting videotape recordings for live supervisory observations, his findings bear much similarity to Acheson's. The subject of Olivero's study, ninety secondary teacher interns, were randomly assigned to one of nine treatment groups. During the two week period in which the study was conducted each subject taught four microteach lessons. After each lesson subjects

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[28]Cooper and Stroud, op. cit., p. 21.

[29]James Lee Olivero, "Video Recordings as a Substitute for Live Observations in Teacher Education," Unpublished Doctoral Dissertation, Stanford University, 1964, Dissertation Abstracts, 25, p. 5769.

recieved one of nine feedback treatments. The Stanford Micro-Teaching Appraisal Guide was used to determine changes in the rating of subjects' teaching performances between the first and fourth lesson.

Olivero tested four hypotheses relating to the source of supervision, the type of feedback provided to the trainee, and the conditions of supervisor observation. Analysis of covariance resulted in the confirmation of three of the major hypotheses of the study, indicating that: (1) trainees who received feedback from supervisors showed greater gains than trainees who engaged in self-analysis only; (2) trainees who received verbal and videotaped feedback made greater gains than trainees who received verbal feedback only; (3) trainees who received feedback from university supervisors made greater gains than those who received feedback from school supervisors. No differences were found between the ratings of trainees who received feedback from supervisors who had observed videotapes of the trainee, and trainees who received feedback from supervisors based upon live observation.

Orme[30] conducted a study in 1966 in which he attempted to assess the effects of various feedback arrangements in combination with the presentation of symbolic and perceptual models of desired teacher behaviors. One hundred and twenty secondary teacher interns were randomly assigned to six treatment groups and subsequently taught three, five-minute lessons. Following each lesson, subjects received one of three variations of feedback: self-evaluation, confirmation feedback, and combined prompting and confirmation feedback. In the self-evaluation

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[30]Michael E. J. Orme, "The Effects of Modeling and Feedback Variables on the Acquisition of Complex Teaching Strategy," Unpublished Doctoral Dissertation, Stanford University, 1966, Dissertation Abstracts, 27, pp. 3320-21.

feedback treatment, subjects evaluated videotapes of the lessons they had conducted. No supervisor was present during the viewing. Confirmation feedback involved a supervisor pointing out and reinforcing the occurrence of desired behaviors in the subject's lesson videotape. In the combined prompting and confirmation treatment, a supervisor viewed demonstration tapes (perceptual models of teaching behaviors) with the subject, pointing out desired behaviors and clues to their recognition.

Multiple analysis of covariance, adjusted for initial teaching performance and modeling effects, indicated that the combined prompting and confirmation feedback led to greater gains in teacher performance than did confirmation feedback only. No significant differences were found in the comparisons of other feedback treatments.

Since the performance of trainees who received supervisory feedback was not significantly different from the performance of trainees who engaged in self-evaluation only, this latter finding of Orme's study tends to indicate that when a trainee is provided with a perceptual model of the teaching behavior to be learned, the presence of a supervisor during the videotape replay is less important.

A study to appraise the effectiveness of videotape feedback in the absence of direct supervision was conducted by Young[31] in 1967. While the major focus of Young's research was upon modeling procedures, he also investigated the efficacy of dubbing supervisory comments on the second soundtrack of an intern's lesson videotape for the purpose of providing "contingent focus" for the intern's subsequent viewing of the tape.

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[31]David B. Young, "The Effectiveness of Self-Instruction in Teacher Education Using Modeling and Videotape Feedback," Address to American Educational Research Association, February, 1968. (ERIC: ED 019 883), 36 pp.

The subjects of Young's study, ninety-four secondary teacher interns, were randomly assigned to six experimental treatments. Each subject's teaching performance was videotaped during a fifteen-minute "pretest lesson" conducted in the classroom to which he was assigned. Two subsequent fifteen-minute classroom lessons taught by interns following university training sessions were also videotaped. While all subjects viewed their own videotapes, only half of the total group were provided with contingent comments recorded on their tapes. The remaining subjects were provided with a written description of teaching skills (non-contingent focus), and were directed to look for the skills in their own lesson videotapes. Nineteen teaching performance variables related to the subjects' use of visual aids and lecturing skills were analyzed to test the hypothesis that "viewing one's own performance with contingent focus is more effective than non-contingent focus."[32]

Subjects' teaching performance in the second and third classroom lessons, adjusted by analysis of covariance for differences in pretest lesson performance, failed to confirm the hypothesis for all nineteen variables. While differences in favor of the group which received contingent focus were significant for several variables, Young's research did not clearly demonstrate the superiority of this supervisory technique.

The fact that the teaching performance of subjects who were provided with written directions of specific behaviors to be attended to during the self-viewing of videotapes was not significantly different from the performance of subjects who received supervisory comments during viewing appears to indicate that if some type of focus is provided

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[32]Ibid., p. 15.

for the viewing of videotaped lesson replays, this medium of feedback can facilitate changes in teacher behavior.

Solomon and McDonald, in reviewing several studies which involved self-viewing of videotapes as a training technique, pointed out that in order for an individual to change his behavior as a result of self-viewing, two conditions appear to be necessary: (1) the individual must know what behaviors are expected of him so that he will be cued to assess the extent to which his own behavior deviates from the behavior expected; and (2) the individual must internalize these expectations and be willing to modify his behavior accordingly. The authors further contend that unless these two conditions are met, the "messages" derived from self-viewing of videotapes cannot properly be considered as feedback. The message can, therefore, be expected to result in behavioral change only if it provides the individual with information about the extent of his departure from a desired standard.[33]

The conclusions of Solomon and McDonald cited above appear to indicate the importance of providing teacher trainees with symbolic and/or perceptual models of the behaviors they are expected to learn so that the value of feedback can be optimized. It is felt that the use of modeling procedures, which are described in the next section, provides the teacher trainee with the "desired standard" against which he can judge his own teaching behavior while viewing videotapes of lessons he has conducted.

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[33]Gabriel Solomon and Frederick J. McDonald, "Pretest and Posttest Reactions to Self-Viewing One's Teaching Performance on Video Tape," Journal of Educational Psychology, 61:280-86, August, 1970.

MODELING

The use of modeling in teacher training involves imitative, or observational, learning; where the learner (teacher trainee) is expected to imitate the behavior of the model (experienced teacher). Modeling as a training procedure should be contrasted with demonstration teaching. While demonstration teaching is also designed to promote imitative learning, it usually involves the demonstration of a global teaching situation such as teaching a reading lesson. By contrast, modeling techniques usually deal with only one specific teaching behavior at a time.

While imitative/observational learning has been used in teacher training, and in apprenticeships in various fields, for many years, it has only recently become the subject of research investigations in teacher education. Much of the early research on modeling techniques in teacher training was based upon the work of Bandura and others who studied the effects of film-mediated models on the aggressive behavior of young children. Wodtke and Brown[34] have presented an extensive review of these studies of aggressive behavior. Elsewhere, Bandura[35] has presented an authoritative summary of the theoretical positions which have emerged from such research. And, while it is somewhat difficult to generalize the findings related to aggressive behavior of young children to teacher training techniques, this research is frequently cited as rationale for studies which attempt to induce behavioral change through modeling.

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[34]Kenneth H. Wodtke and Bobby R. Brown, "Social Learning and Imitation," Review of Educational Research, 27:514-37, December, 1967.

[35]Albert Bandura, "Influence of Models' Reinforcement Contingencies on Acquisition of Imitative Responses," Journal of Personality and Social Psychology, 1:589-95, June, 1965.

In the research dealing with the use of modeling techniques in teacher training, both symbolic and perceptual modeling have been employed. Symbolic models consist of a detailed written description and rationale for the use of a given teaching behavior. A perceptual model consists of a short filmed or videotaped sequence depicting the use of a specific teaching behavior. Studies related to the use of modeling in teacher training have sought to answer several questions about symbolic and perceptual modeling protocols.

An investigation conducted by Orme[36], which was reviewed in the previous section of this chapter, dealt with a comparison of the effectiveness of symbolic and perceptual modeling. The results of Orme's study indicated that the viewing of perceptual models by teacher trainees resulted in greater changes in teaching behavior than did the use of symbolic models. At the same time it was found that the combined use of symbolic and perceptual models was more effective than the use of either modeling procedure alone.

More recently, Fitzgerald[37] conducted a study to assess the relative effects of symbolic and perceptual modeling of verbal teaching behavior on the subsequent verbal behavior of student teachers. The fifty-two preservice teachers who served as subject in the study were assigned to either symbolic or perceptual modeling treatments. Half of the total group viewed perceptual models depicting verbal interaction representative of each of the ten categories of Flanders' system of inter-

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[36]Orme, op. cit.

[37]Russell Fitzgerald, "The Effects of Perceptual and Symbolic Models on the Verbal Behaviors of Student Teachers," Address to the Annual Convention of the American Educational Research Association, New York, February, 1971. (ERIC: ED 048 110)

action analysis. The remaining subjects were provided with a written description (symbolic model) illustrating verbal interaction in each category. Analysis of the data gathered from five, fifteen-minute observations of the subjects' verbal teaching behavior during their student teaching experience indicated that subjects who had been provided with perceptual models exhibited significantly less direct verbal behavior.

Allen and his co-workers at Stanford conducted an investigation to assess the comparative effectiveness of including non-instances of a teaching behavior to be learned in the perceptual model of the behavior. In the same study, the effectiveness of symbolic and perceptual models was also compared. Subjects of the study, one-hundred and twenty Secondary Education Interns, were randomly assigned to one of eight experimental treatments consisting of various combinations of perceptual and symbolic models of the use of higher cognitive questioning. With the subjects' use of higher cognitive questions as the criterion variable, it was found that symbolic and perceptual models produced approximately equal results. It was also found that in post-training lessons conducted by interns, those who had viewed perceptual models which contained only positive instances of higher cognitive questioning used that type of question more frequently than did interns who had viewed perceptual models containing both positive and negative instances of the behavior.[38]

Bush and Gage[39] summarized the results of several investigations related to modeling procedures which were conducted by the Stanford Cen-

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[38]Dwight W. Allen, et al., "A Comparison of Different Modeling Procedures in the Acquisition of Teaching Skill," February, 1967. (ERIC: ED 011 261)

[39]Bush and Gage, op. cit., pp. 88-89.

ter for Research and Development in Teaching. They concluded that for initial learning of a complex teaching behavior, the use of a perceptual model which contained only positive instances, i.e., no non-instances, of the behavior to be learned was preferable. However, they noted that a perceptual model which contains both instances and non-instances of a behavior, when introduced after the intial model, is useful as a discrimination training stretegy.

Young found that providing a brief example (perceptual model) of a teaching behavior was more effective for learning complex verbal behavior than was the demonstration of the behavior in a complete lesson context.[40]

Elsewhere, Young reported an extensive review of research related to modeling procedures in teacher training. Among his conclusions were the following statements: (1) "Modeling as a training variable has been demonstrated effective in modifying teacher behavior"; and (2) "Models featuring only positive instances of teaching behaviors have been demonstrated to have greater transfer to teaching situations other than the one in which training has occurred."[41]

While the question of whether symbolic or perceptual modeling is more effective cannot be answered on the basis of the research conducted to date, the question is not of major significance to the present study since both symbolic and perceptual models were employed. On the basis of the research reviewed above, it appears that the combination of

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[40]Young, op. cit.

[41]David B. Young, "The Modification of Teacher Behavior Using Audio Video-Taped Models in a Micro-teaching Sequence," Educational Leadership, January, 1969, p. 42.

these two modeling procuedures can be expected to make a significant contribution to behavioral change.

MINICOURSES

A major thrust of the Teacher Education Program of the Far West Laboratory, one of fifteen federally-funded research and development laboratories, has been the development of "minicourses," self-contained auto-instructional packages designed to increase the effectiveness of classroom teachers.[42] Each minicourse provides approximately fifteen hours of teacher training and is designed to aid teachers in the acquisition and refinement of specific teaching behaviors.

Much of the design of the training paradigm employed in minicourses (the Minicourse Instructional Model[43]) was based upon earlier research on microteaching, feedback and modeling conducted at Stanford. The research findings pertinent to each component of the Minicourse Instructional Model have been presented in the preceding sections of this chapter. In the present section, a review of research which deals with the effectiveness of minicourses is presented.

Before being released by the Far West Laboratory, each minicourse is subjected to a rigorous research and development cycle which includes three field tests. The research reports which deal with the effectiveness of minicourses are the result of such field tests. While numerous

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[42]At the time of this writing, five minicourses had been released and ten more were in various stages of development. The first course was released in April, 1970.

[43]Walter R. Borg, et al., The Minicourse: A Microteaching Approach to Teacher Education. New York: Macmillan Educational Services, Inc., 1970.

authors[44, 45, 46, 47] have cited and favorably reviewed the research conducted by the Far Lest Laboratory, few independent investigations of the use of minicourses have been reported. To date, no research has been reported which deals with Minicourse Eighteen, the subject of the present investigation.

The greatest volume of minicourse research reported was the outcome of the main field test of Minicourse One, "Effective Questioning-Elementary Level." Minicourse One was designed to develop teachers' use of twelve specific behaviors related to conducting discussion lessons. Because it served as a prototype for later minicourses, the research pertaining to Minicourse One served not only as a test of its content, but also as a test of the teacher training model it employed. The findings related to Minicourse One are, therefore, pertinent to the present study since the training model employed in Minicourse Eighteen is basically the same as that employed in Minicourse One.

In the main field test of Minicourse One, which was conducted in 1967, a single-group, pre-, post-, and delayed post-test design was employed to study the effects of the minicourse on teacher's use of discussion management behaviors. The subjects of the study consisted of forty-eight fourth, fifth, and sixth grade in-service teachers, four

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[44]Ned A. Flanders, Analyzing Teacher Behavior. Reading, Massachusetts: Addison-Wesley, 1970, pp. 371-373.

[45]N. L. Gage, Teacher Effectiveness and Teacher Education: The Search for a Scientific Basis. Palo Alto, California: Pacific Books, 1972, pp. 202-203.

[46]Phillip M. Ward, "The Use of the Portable Videotape Recorder in Helping Teachers Self-Evaluate Their Teaching Behavior," January, 1970. (ERIC: ED 038 356), p. 18.

[47]Cooper and Allen, op. cit., pp. 15-16.

from each of twelve schools in six school districts. All teachers who participated in the main field test of Minicourse One were volunteers.

Immediately before and after the training each teacher conducted a twenty-minute discussion lesson with his entire class. The pre- and post-course lessons were videotaped in the teacher's regular classroom. Four months after the training was completed a third lesson was taught by thirty-eight of the original subjects and was again videotaped. Lesson videotapes were scored, double blind, by trained raters to determine the frequency of teachers' use of the twelve specific behaviors related to the content of the training. Such behaviors as "prompting" and "redirection," seeking further clarification, pausing three to five seconds after asking a question, repeating or answering ones own question, and repeating pupils' answers were scored. The mean frequency of teachers' use of each behavior in the pre-course lesson was compared with the mean frequency of use of the behavior in the post-course lesson. Application of the *t*-test for correlated means, computed for each behavior, indicated that there was a significant difference, pre to post, on ten of the twelve behaviors. A significant decrease in the percentage of discussion time taken by teacher talk was also reported.[48]

Four months after the initial training was completed, delayed post-test data were secured for thirty-eight of the original forty-eight subjects. Analysis of these data for the ten behaviors which had shown a significant change between the pre- and post-course lessons, indicated that teachers had either maintained or improved the level of performance they had achieved in the post-course lesson on all except one behavior.

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[48]Walter R. Borg, et al., "The Minicourse: A New Tool for Education of Teachers," Education, 90:232-38, February-March, 1970.

Borg [49] presented a detailed discussion of the limitations of the main field test of Minicourse One. Among the limitations he noted the lack of control group data; the possible biasing effect of the method of teacher behavior data collection, i.e., videotaping in the teachers' classrooms; and, the possibility that teachers may have been cued to "produce" certain behaviors in their criterion lessons as a result of the training. Based upon the Laboratory's experience in producing perceptual model lessons for Minicourse One, Borg considered the latter possibility "remote" since much difficulty had been encountered in getting the teachers of the model lessons to use the desired behaviors. While stating that none of the limitations of the main field test appeared to be sufficiently serious to account for the changes in teacher behavior pre to post, Borg indicated the need for further study of Minicourse One and the training model it employed.

In addition to the main field test of Minicourse One, which utilized in-service teachers as subjects, Borg, et al. conducted a study to determine the efficacy of using the minicourse with preservice teachers.[50] A related purpose of the study was to provide data relative to the Minicourse Instructional Model by estimating the degree to which microteaching and feedback from videotape self-evaluation influenced teacher acquisition of the behaviors in Minicourse One.

Seventy-nine elementary-level student teachers from three teacher-training institutions served as subjects in the study. In College "A"

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[49] Borg, et al., op. cit., Macmillan, pp. 83-86.

[50] Walter R. Borg, et al., "Videotape Feedback and Microteaching in a Teacher Training Model," Journal of Experimental Education, 37:9-16, Summer, 1969.

one group of subjects completed all phases of the minicourse training which included reading a handbook, viewing instructional and model lesson films, conducting microteach lessons, and performing self-evaluations of videotapes of their microteach lessons (Complete Training). A second group at the same college read the handbook and viewed the instructional and model lessons, but was not required to microteach (No Microteach). College "B" contained one group of subjects who completed all phases of the training (Complete Training), and a second group who engaged in all phases of the training except self-evaluation of videotapes of their microteach lessons (No Feedback). The third college, "C," provided a pure control group which was not introduced to any minicourse training (No Training).

Each of the seventy-nine subjects taught a fifteen-minute pre- and post-course discussion lesson in the classroom to which he was assigned for student teaching experience. Videotapes of the lessons were analyzed to determine the frequency of subjects' use of the ten behaviors for which a significant pre to post difference had been found in the main field test of Minicourse One.

Pre-post comparisons were performed within each of the five groups of subjects. In this analysis the *t*-test for correlated means was used to assess the significance of the difference between the mean frequency of subjects' use of the ten teaching behaviors in the pre- and post-course lessons. Significant differences were found on four to six behaviors within each of the four groups of subjects who had been exposed to some variation of training with Minicourse One. Within the fifth group, which had no minicourse training, significant differences, pre to post, were found for three behaviors. The "gains" of this latter

group were apparently the result of either experience gained through student teaching, or random variation in the teaching behavior of subjects in this control group.

In addition to the within group comparisons described above, analysis of covariance, with pre-course teaching performance as the covariate, was employed for between group comparisons. Comparison of the two groups at College "A" (Complete Training vs. No Microteach) yielded a significant F ratio for only two of the ten behaviors compared. No significant differences were found between the performances of the two groups of College "B" subjects (Complete Training vs. No Feedback). When the performance of the two groups of subjects at Colleges "A" and "B" who had completed all phases of the training was compared with the performance of the College "C" control group subjects (Complete Training vs. No Training) a significant difference was found on only two behaviors.

The type of design and sampling procedures employed in the above study do not permit a conclusive answer to the question of the value of microteaching and feedback in the Minicourse Instructional Model. Neither do the data from the sample population studied support the hypothesis that the addition of microteaching and feedback to the training procedures results in significantly greater gains in teacher performance. A comparison of the behavioral changes made by in-service teachers in the main field test with the lesser changes made by preservice teachers appears to indicate that Minicourse One and, by inference, the type of training it employs, are less effective with preservice teachers. However, upon closer examination of the research designs employed in the studies cited above it is extremely difficult to separate the effects of

the method of training from the content of the training. It may well be that there exists a three-way interaction between teacher experience (in-service vs. pre-service), training procedures, and course content. Unfortunately, data presented in the two studies cited above do not provide an answer to this question.

In addition to the data relating to Minicourse One, Far West Laboratory staff members have reported[51] the results of the field tests of four other mimicourses which have been released for distribution. The field tests of these latter minicourses served not only as a check of the content of the individual courses, but as a further test of the generalizability of the Minicouse Instructional Model. In general, the main field tests of Minicourses Two, Three, Five, and Eight were similar in design to the main field test of Minicourse One described above. Each field test included approximately fifty in-service teachers. Pre and post teacher behavior data for the sample in each study were gathered either by videotape recordings or by direct observation. Data were subsequently analyzed to determine the significance of behavioral change as a result of the minicourse training.

While the data and reported results of the main field tests of Minicourses Two, Three, Five, and Eight were reviewed, for the sake of brevity these results are not detailed here. As a general statement concerning the results of these field tests, the following conclusion by Langer, a Far West Laboratory staff member, seems to be supported by the

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[51]Kelly and Gall reported the results of the main field tests of Minicourses Two and Five at the AERA Convention in 1970. See William Pilder (ed.), Abstracts One: 1970 Annual Meeting Paper Sessions, p. 57.

Langer reported on the results of the field test of Minicourses Two, Three, Five, and Eight at the Annual Meeting of the American Psychological Association in 1969. See ERIC Document # ED 032 293.

data presented: "Although the results cover a wide range of courses, it would appear that all courses have succeeded in providing teachers with a generalized approach to systematically coping with problem areas."[52] Langer further concluded that most teachers who served as subjects in the main field tests changed their teaching behavior as a result of the minicourse training.

SUMMARY AND CONCLUSIONS

In their review of microteaching research, Cooper and Allen stated that "more reliable knowledge about this method of training teachers is needed."[53] While it is not completely clear whether they were calling for additional "reliable" research, or research which is more reliable, the review of the literature presented in this chapter indicates the need for the latter.

The question of the "effectiveness of microteaching," per se, is difficult to answer because of the variety of situations in which it has been studied, and because of the different criteria of effectiveness which have been applied to it. Despite the relatively few rigorously-designed studies of microteaching which have been performed to date, several conclusions seem warranted. It can be concluded with some degree of certainty that microteaching is at least as effective as more traditional approaches to teacher training when teaching behavior is used as the criterion. Some researchers have viewed microteaching as more effective than other approaches because it generally requires less time and

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[52]Philip Langer, "The Range of Teaching Skills That Can Be Changed by the Minicourse Model," (ERIC: ED 032 293), p. 12.

[53]Cooper and Allen, op. cit.

entails fewer administrative difficulties.

Microteaching appears to be particularly well-suited to the development of specifically-defined teaching behaviors, especially when it is combined with the use of modeling techniques and video-feedback. Early studies of the use of video-feedback tended to indicate the necessity of having a supervisor present during the trainee's self-viewing of a lesson he had conducted. The findings of more recent studies indidate that if some other means of directing the trainee's attention to specific aspects of his teaching is provided, the presence of a supervisor is less important in bringing about changes in teaching behavior. When teacher-training procedures include the use of symbolic and perceptual models of desired behaviors, the value of video-feedback appears to be further enhanced. Under such training conditions, model lessons appear to serve as a standard against which a trainee can judge his own performance by assessing the extent to which his teaching behavior is congruent with the standard set by the model.

The combination of symbolic and perceptual modeling, microteaching, and self-evaluation of video-feedback appears to be a particularly effective approach to training teachers to employ specific behaviors. Various previously introduced minicourses which have employed this type of training procedure have resulted in significant changes in teacher behavior. And, while few studies have been reported which have compared the post-training behavior of in-service teachers with the post-training behavior of preservice teachers trained with minicourses, the research to date suggests that minicourses may be more effective in changing the teaching behavior of in-service teachers.

The main field tests of five minicourses, and related research

studies, have indicated that both the training procedures employed in minicourses (the Minicourse Instructional Model) and the content of the individual minicourses have been effective in bringing about behavioral change in teachers. It should be noted, however, that the field tests frequently did not include data on control group teachers.

The question which has not yet been answered satisfactorily is the effects on pupil performance of teacher behavior changes as a result of training with minicourses. A major focus of the present study is upon this question.

CHAPTER III

METHOD OF RESEARCH

The research methods employed in this study were directed toward the assessment of the effects of a training program for in-service and preservice teachers on teacher behavior related to teacher reading decoding skills and upon pupil performance in reading.

RESEARCH DESIGN

The Nonequivalent Control Group Design[1] was employed in the study. For the teacher behavior phase of the study, pre- and post-course data were gathered on two groups of in-service and preservice teachers who were not equated through random sampling procedures. One group of teachers, the "Treatment Panel," was assigned to treatment procedures, i.e., training with Minicourse Eighteen. The other group, the "Non-treatment Panel," recieved no training.

For the pupil performance phase of the study, the treatment panel consisted of pupils in the classes of in-service teachers trained with Minicourse Eighteen, while the non-treatment panel contained pupils in the classes of teachers not trained with Minicourse Eighteen.

The "quasi-experimental" design employed for the study could be

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[1]Donald T. Campbell and Julian C. Stanley, "Experimental and Quasi-experimental Designs for Research on Teaching," in N. L. Gage (ed.), Handbook of Research on Teaching. Chicago: Rand McNally and Co., 1963, p. 217.

depicted as follows:

Treatment Panel: O_1 X O_2

Non-treatment Panel: O_1 O_2

X = Training of teachers with Minicourse Eighteen

O_1 = Pre-course teacher behavior data: lesson videotape
Pre-course pupil performance data: Stanford and Minicourse Achievement Tests

O_2 = Post-course teacher behavior data: lesson videotape
Post-course pupil performance data: Stanford and Minicourse Achievement Tests

SUBJECTS

Teacher Subjects

The thirty-three subjects of the teacher behavior phase of the study included fourteen primary grade in-service teachers, who represented four elementary schools in Niagara Falls, New York, and nineteen preservice teachers who were engaged in intern and student teaching experiences in Niagara Falls and the Greater Buffalo Metropolitan Area during the time of the study. The distribution of in-service and preservice teachers between treatment and non-treatment panels is illustrated in Table I.

In-service teachers. Of the fourteen primary grade in-service teachers included in the study, seven were assigned to the treatment panel, and seven to the non-treatment panel. Prior to the study, all fourteen had indicated tentative interest in the Minicourse Eighteen training. However, the utilization of videotape recording equipment in the training made it impossible to assign teachers within the same school to treatment and non-treatment procedures. Consequently, the seven

TABLE I

ASSIGNMENT OF TEACHER SUBJECTS TO TREATMENT
AND NON-TREATMENT PANELS

TREATMENT PANEL (N=16) Trained with Minicourse Eighteen	NON-TREATMENT PANEL (N=17) Not trained with Minicourse Eighteen
In-service Teachers (N=7)	In-service Teachers (N=7)
Grades 1, 2 & 3:	Grades 1, 2 & 3:
School "A"	Schools "B," "C" & "D"
Preservice Teachers (N=9)	Preservice Teachers (N=10)
Student Interns:	Student Teachers:
Elementary School: Niagara Falls, New York	Elementary Schools: Greater Buffalo, New York

teachers in the treatment panel were, at the time of the study, all teaching in the same school. The remaining seven in-service teachers in the study, who comprise the non-treatment panel, represented three different elementary schools within the same city school district.

Both treatment and non-treatment panels included one first grade teacher, one teacher of a class containing both first and second grade pupils, two second grade teachers, two third grade teachers, and a teacher of a class containing both third and fourth grade pupils. Each panel included six female teachers and one male teacher.

Of the seven in-service teachers in the treatment panel, six were tenured, and three had earned Master's Degrees. The non-treatment panel included five tenured teachers, two of who held Master's Degrees, and one of whom held a Master's equivalent.

Table II illustrates the comparability of in-service teachers in the treatment and non-treatment panels on selected variables.

The participation of the in-service teachers in the study was voluntary. Neither treatment or non-treatment panel teachers were given any information about the hypotheses of the study, nor did they have knowledge of the comparative aspects of the study. Further, there was no evidence to suggest that either group was aware of the fact that another group of teachers was being studied simultaneously.

Preservice teachers. At the time of the study, the nineteen preservice teachers studies were engaged in intern and student teaching experiences. By the completion of the study, all nineteen preservice teachers had completed fourteen weeks of either intern or student teaching experiences. All were college seniors majoring in elementary education, and had participated in field experiences during their junior year.

TABLE II

MEANS FOR TREATMENT AND NON-TREATMENT IN-SERVICE TEACHERS ON SELECTED VARIABLES

Variable	Treatment Panel (N=7) Mean	Non-treatment Panel (N=7) Mean
Age	35.0	38.0
Total years teaching experience	11.5	10.6
Total years teaching primary grades	8.5	10.8
Total years teaching present grade	5.0	7.8
Total semester hours beyond Bachelor's	24.6	23.3
Number of reading courses (graduate and undergraduate)	3.2	3.6

The nine preservice teachers in the teatment panel were participating in an intern program sponsored by the State University of New York at Buffalo at an elementary school in Niagara Falls, New York. In contrast to the more traditional student teaching experience where the trainee is assigned to one teacher, preservice teachers in the intern program were assigned to a cross-graded "unit" composed of three or four teachers and approximately eighty to one-hundred pupils.

While all nine preservice teachers in the treatment panel had volunteered for assignment to the intern program, the requirement that they take Minicourse Eighteen was not known to them beforehand. All nine interns who received the training with Minicourse Eighteen were seniors at the State University of New York at Buffalo, and none had previously taken any methods courses in the teaching of reading.

The ten preservice teachers in the non-treatment panel were, at the time of the study, engaged in student teaching in primary grade classrooms in elementary schools in Buffalo, Cheektowaga, Tonawanda, and North Tonawanda, New York. All ten had taken either a two or three semester-hour methods course in the teaching of reading prior to their student teaching experience. Three of the preservice teachers in the non-treatment panel were seniors at the State University of New York at Buffalo, while the remaining seven were enrolled as seniors at the State University of New York College at Buffalo.

Table III illustrates the comparability of preservice teachers in the treatment and non-treatment panels.

Pupil Subjects

The two-hundred and thirty (230) subjects of the pupil performance phase of the study consisted of first, second, and third grade

TABLE III

MEANS FOR TREATMENT AND NON-TREATMENT PRESERVICE TEACHERS ON SELECTED VARIABLES

Variable	Treatment Panel Mean (N=9)	Non-treatment Panel Mean (N=10)
Age	24.0	21.4
Semester hours of education courses	32.5	28.0
Overall Quality Point Average	3.26	3.33

pupils in the classes of in-service teachers in the treatment and non-treatment panels. Every pupil was enrolled in one of the four cooperating elementary schools in Niagara Falls, New York at the time of the study.[2] Pupils were assigned, as a class, to treatment or non-treatment procedures by virtue of their teacher's involvement or non-involvement in the Minicourse Eighteen training program.

Table IV illustrates the distribution and number of pupils per class in the treatment and non-treatment panels. (For convenience and ease of identification, the four schools which the pupils represent are designated as Schools "A," "B," "C" and "D.")

Pupil subjects from schools "A" (treatment) and "B" (non-treatment) represent the total enrollment of pupils in grades one through three in those schools. The pupil subjects from schools "C" and "D" were selected at random, by class grouping, from the available primary classrooms in those schools.

Comparability of Treatment and Non-treatment Schools

As a general indicator of the socio-economic level of the neighborhoods served by the schools from which the pupil subjects were drawn, the school's enrollment (K-6), and the number and percentage of children from families receiving welfare assistance through the Aid to Families With Dependent Children (AFDC) Program are presented in Table V. The mean percentage of children from families receiving welfare assistance (AFDC) in the non-treatment schools was 17.1 percent, while the AFDC population in the treatment school was 17.8 percent.

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[2]Niagara Falls has twenty-one elementary schools with a Kindergarten through sixth grade pupil enrollment of 9,007.

TABLE IV

DISTRIBUTION OF PUPIL SUBJECTS AMONG SCHOOLS BY GRADE

Grade	Treatment Panel Enrollment (N)	School	Grade	Non-treatment Panel Enrollment (N)	School
1	12	"A"	1	18	"B"
1-2	11-6	"A"	1-2	4-11	"C"
2	18	"A"	2	16	"B"
2	20	"A"	2	17	"D"
3	20	"A"	3	17	"B"
3	21	"A"	3	25	"D"
3-4	7*	"A"	3-4	7*	"B"
TOTAL:	115		TOTAL:	115	
First Grade:	23		First Grade:	22	
Second Grade:	44		Second Grade:	44	
Third Grade:	48		Third Grade:	49	

*Third grade pupil enrollment in third and fourth grade combination classroom

TABLE V

ENROLLMENT AND AFDC POPULATION IN TREATMENT AND NON-TREATMENT SCHOOLS

School	Total Enrollment* (K-6)	N of AFDC Children	% of AFDC Children
School "A" (Treatment)	392	70	17.8
School "B" (Non-treatment)	212	28	13.2
School "C" (Non-treatment)	469	38	8.1
School "D" (Non-treatment)	515	154	29.9

*Enrollment data as of March, 1971

The boundaries for the elementary school attendance areas for the schools from which the pupil sample was drawn are approximately contiguous. There is, therefore, much similarity in the socio-economic levels of the neighborhoods served by these schools. The largest percentage of pupils in the study came from homes in which one or both parents were employed as unskilled or semi-skilled workers in local industries.

A further index of comparability which has relevance to this study is the amount of instructional time devoted to the teaching of reading by teachers in the treatment and non-treatment schools. By teacher self-report, the mean number of hours spent on reading instruction by teachers in the treatment panel was 8.6 hours per week. The mean for the non-treatment panel was 8.1 hours per week.

TREATMENT PROCEDURES

Treatment Panel

Minicourse Eighteen: "Teaching Reading as Decoding" was the basis of the training provided for in-service and preservice teachers in the treatment panel. The emphasis in the training was upon developing and refining specific teacher behaviors used in teaching reading decoding skills. The experimental version of the course contained five instructional sequences and a review sequence designed to build pupil decoding skills in the following areas: grapheme recognition; phoneme-grapheme correspondence in predictable and variable consonants, consonant blends and digraphs; phoneme-grapheme correspondence in similar and contrasting spelling patterns and affixes; syntactic and semantic clues (contextual clues); and, the development of a problem-solving strategy for decoding unknown words.

At the start of each instructional sequence, participating teachers read the appropriate chapter of the Teacher Handbook which contained the teacher and pupil objectives for the sequence, research and rational pertinent to the behaviors to be learned, and a symbolic model for the teaching behaviors of the sequence. The teachers then met as a group to view the videotape of the instructional and model lessons of the sequence. During the viewing of the model lesson (perceptual model) each participant identified and tallied specific teacher behaviors employed in the lesson using a checklist provided in the Teacher Handbook. Group discussion of the lessons followed the viewing.

Individually, teachers then planned a ten to fifteen minute lesson to practice the behaviors dealt with in the model lesson, and subsequently taught and videotaped the lesson. The videotape of the microteach lesson was then replayed and analyzed by the individual teacher using a self-analysis form in the Handbook. A second, and, in some sequences a third, microteach lesson was then planned, conducted, videotaped and analyzed to practice additional teaching behaviors dealt with in the sequence. Each sequence also included a "Criterion Lesson" which was conducted, or not conducted, by the participant on the basis of the outcome of the application of specific criteria outlined in the Handbook.

The activities described above were repeated during each of the five instructional sequences of the course. Figure 1 illustrates the teacher activities during each course sequence. Completion of the activities of one sequence required approximately one week.

In-service teachers in the study conducted the microteach lessons within their own classrooms with a small group of children while the remainder of their pupils worked independently within the same room. The

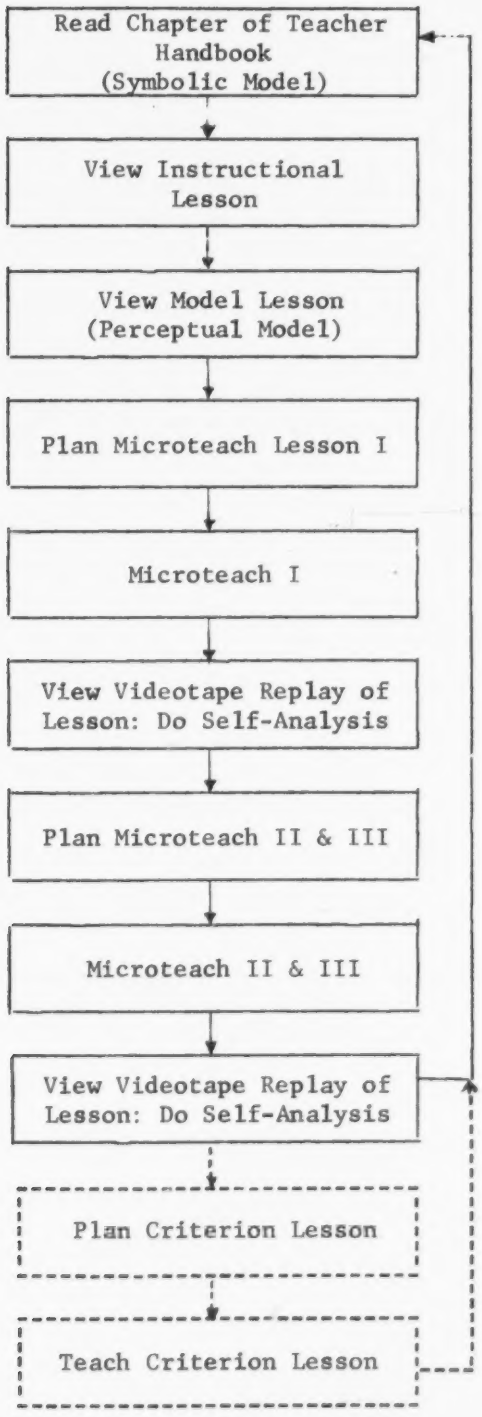
Read Chapter of Teacher Handbook (Symbolic Model)
View Instructional Lesson
View Model Lesson (Perceptual Model)
Plan Microteach Lesson I
Microteach I
View Videotape Replay of Lesson: Do Self-Analysis
Plan Microteach II & III
Microteach II & III
View Videotape Replay of Lesson: Do Self-Analysis
Plan Criterion Lesson
Teach Criterion Lesson

Figure 1

TRAINEE ACTIVITIES DURING EACH INSTRUCTIONAL SEQUENCE OF MINICOURSE EIGHTEEN

preservice teachers also used small groups of children for their microteach lessons, but conducted their microteaching in a separate room set aside for that purpose. Both in-service and preservice teachers, operated the equipment used for videotaping their lessons.

The training of the treatment panel teachers began on November 9, 1971, and was completed on January 14, 1972. Training of the in-service teachers took place within the school in which they were teaching (School "A"). The preservice teachers received the training in the school to which they were assigned for the intern program. In-service and preservice teachers did not meet as a total group.

Non-treatment Panel

Although no specific training was provided for the non-treatment panel, the method of teacher behavior data collection, i.e., the videotaping of a pre-course lesson, might be considered a placebo. After teaching the videotaped lesson, both in-service and preservice teachers in the non-treatment panel viewed the lesson replay, although the outcome of the lesson was not specifically discussed.

The feedback to the teacher of her pupils' pre-test scores was also part of the placebo. In-service teachers in the non-treatment panel received a list of their pupils' grade equivalent scores on the Stanford subtests.

DATA COLLECTION

Teacher Behavior Data

One week before the training of the treatment panel began, all thirty-three in-service and preservice teachers in the study taught a twenty to thirty minute lesson on reading decoding skills to three pupils.

Thirteen week later, two weeks after the training ended, all subjects again taught a similar lesson. Both pre- and post-course lessons were videotaped.

Specific written instructions for the content and sequence of the lessons (see Appendix A) were given to the teachers one week in advance of the taping. The pre- and post-course lessons, which were designed by the Far West Laboratory for field test use in conjunction with Minicourse Eighteen, were based upon different, yet parallel, content. Both lessons were divided into four parts and required the teaching of two graphemes of low discriminability; the grapheme-phoneme correspondence of a predictable and a variable consonant, a consonant blend and a consonant digraph; the grapheme-phoneme correspondence of a group of words composed of similar and contrasting spelling patterns and affixes; and the use of context clues in arranging randomized words into a sentence in order to decode a homograph.

The lessons were conducted in a room apart from the teacher's own classroom and were videotaped by a technician who set up the equipment but left the room after starting the recorder. During the lesson taping only the teacher and her three pupils were in the room. An effort was made to conceal the recording equipment to make it as unobtrusive as possible, although the teacher was aware of the fact that the lesson was being videotaped.

Following the completion of the post-course lessons, the sixty-six pre- and post-course lesson videotapes, which were identified only by number, were arranged in random order and analyzed double blind, by trained raters to determine the frequency of teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills.

The eight lesson raters were not familiar with the hypotheses of the study, nor did they know which teachers were in the treatment and non-treatment panels.

A series of eight observation schedules[3], which included a total of twenty-seven teaching behaviors, were employed in the analysis. While Appendix B contains a complete list of the specific behaviors included in the observation schedules, some selected examples are presented below along with the descriptor for the task- focus of the behavior:

Behaviors related to teaching grapheme recognition:

Ask pupil to match letter with same letter

Ask pupil to tell where letter is in word: beginning, middle, or end

Ask pupil to describe how two letters differ

Behaviors related to teaching grapheme-phoneme correspondence:

Pronounce and show word to illustrate correspondence

Write and pronounce word pupil suggested

Present word examples for more than one sound of letter

The behaviors included in the observation schedules, while not all-inclusive of the variety of behaviors which could be employed in teaching reading decoding skills, were assumed to be mutually exclusive.

Eight lesson raters were individually trained in the use of one observation schedule. Training of the raters was accomplished by first discussing the specific behaviors to be identified in conjunction with the viewing of a videotape illustrating those behaviors. The trainer and the rater then viewed a second videotape together and tallied the

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[3]The observation schedules, or "Critiquer Forms," were developed by the Far West Laboratory.

frequency of the occurrence of the behaviors included in the observation schedule being learned by the rater. A criterion of percent of trainer-rater agreement of 85, or better, was required before the rater began to critique the lesson videotapes. If the criterion was not achieved on the first training tape, a second tape was critiqued jointly.

Before the raters began the critiquing, the trainer-rater percent of agreement for six of the raters ranged between 94 and 99, while the remaining two raters achieved 89 and 93 respectively. The maintenance of trainer-rater percent of agreement was also checked again during the period of time the tapes were being critiqued by the raters. For this check the trainer selected at random and critiqued a tape from among the tapes the rater had completed.

Intra-rater consistency was also checked during the tape critiquing period. Each rater was asked to recritique a tape he had previously completed. All raters achieved a consistency percent of agreement above 88.

Pupil Performance Data

To assess pupil performance in reading, the "Word Study Skills" and "Paragraph Meaning" subtests of the Stanford Achievement Test, Primary Battery I or II, were administered pre and post to pupils in the classes of in-service teachers in the treatment and non-treatment panels. These two subtests were selected for their relevance to the content of the teacher training with Minicourse Eighteen. The items on the "Word Study Skills" subtest require the pupil to apply his knowledge of grapheme-phoneme correspondences, while the "Paragraph Meaning" subtest require the use of contextual clues to supply a missing word from a sentence.

Pre- and post-data on the Stanford subtests were gathered for only the second and third grade pupils in the study (Treatment, N=92; Non-treatment, N=93). Since the items in the "Word Study Skills" and "Paragraph Meaning" subtests of the Stanford Primary Battery I require basic reading ability, no norms are available for the beginning of first grade. Thus, first graders were not tested with the Stanford subtests.

During the week of October 25, 1971, two weeks before the training of the treatment panel teachers began, Form W of the Stanford "Word Study Skills" and "Paragraph Meaning" subtests was administered to all second and third grade pupils in the classes of in-service teachers in the treatment and non-treatment panels. Form X of the same subtests was administered during the week of February 14, 1972, four weeks after the training of the treatment panel teachers ended.

Additional data on pupil performance on reading decoding tasks were gathered by administering parallel forms of the Minicourse Eighteen Achievement Test pre and post to all first, second and third grade pupil subjects in the study. This test, which was developed by the Far West Laboratory, is non-standardized and contains the following four subtests: Grapheme Recognition, Phoneme-Grapheme Correspondence; Larger Letter Units; and, Contextual Clues. Directions for the administration of the Minicourse Test are included in Appendix C.

The test-retest interval for the Minicourse Test, fourteen weeks, was the same as for the Stanford subtests. The Minicourse Test was administered during the same weeks the Stanford was administered.

LIMITATIONS

Perhaps the greatest limitation of the present study is in the

area of generalizability, or external validity. While the question of generalizability is never completely answerable, the reader should exercise caution in generalizing the findings contained herein to the total population of in-service and preservice teachers. The findings may, however, be reasonably generalized to the local populations from which the panels of teachers in the study were selected, and to similar situations elsewhere.

A further limitation arises from the researcher's inability to assign both treatment and non-treatment procedures to teachers within the same school. The possibility of "school effects" upon both pupil and teacher data should be noted.

Finally, the reader should be aware of the numerous factors which contribute to pupil growth in reading, and must, therefore, exercise judgment in attributing gains in pupil achievement solely to the effects of teacher training, or lack of training, with Minicourse Eighteen.

CHAPTER IV

RESULTS OF THE RESEARCH

In this chapter each hypothesis of the study is restated, following which the data and findings pertinent to the hypothesis are described.

TEACHER BEHAVIOR

The instruments used to gather criterion data on teacher behavior, which have been described in the previous chapter, were devised to include the major training behaviors of Minicourse Eighteen. The rationale for the method of teacher behavior data collection was based upon the assumption that the post-course lessons conducted by teachers who were trained with Minicourse Eighteen would adequately reflect the influence of the training upon their teaching behavior. If this assumption can be accepted it would follow that the value of the training could be related to the significance of changes in teacher behavior between the pre- and post-course lessons.

Hypothesis One: Treatment Panel Teacher Behavior Change

The following hypothesis was conceived as a means of studying behavioral changes among treatment panel teachers between the pre- and post-course lessons:

> The mean frequency of the use of twenty-seven specific behaviors related to teaching reading decoding skills by a panel of in-service and preservice teachers (N=16) trained with Minicourse Eighteen, as derived from the scoring of post-course lesson videotapes, will differ significantly in the expected

direction from the mean frequency of the use of these behaviors in the pre-course lesson videotapes.

In order to provide data pertinent to this hypothesis, the mean gain in the frequency of the treatment panel teachers' use of twenty-seven specific teaching behaviors was studied. Of the twenty-seven behaviors, increase in the use of twenty of the behaviors was considered desirable, while the use of the remaining seven behaviors was expected to decrease as a result of the training. With the exception of three of the behaviors which were expected to increase, the direction of change on all behaviors was as predicted. The amount of mean change on the three behaviors which did not increase as expected was minimal (-.10, -.01 and -.12).

In order to test the hypothesis that the pre to post difference in the mean frequency of the use of each of the twenty-seven behaviors by the sixteen teachers in the treatment panel was equal to zero, the t-test for correlated means was employed. As indicated in Tables VI and VII, sixteen of the twenty-seven resulting t values were significant beyond the .05 level. (A one-tailed test was employed.)

For clarity of presentation and interpretation of the teacher behavior data, it will be noted that in Tables VI and VII the twenty-seven behaviors have been grouped into seven subsets. The descriptor for each subset represents the task focus of the behaviors included under it. The first four subsets, Grapheme Recognition, Grapheme/Phoneme Correspondence, Larger Letter Units, and Contextual Clues, which are presented in Table VI, relate to specific training sequences in Minicourse Eighteen, and to a specific part of the pre- and post-course lessons. Behaviors in the remaining three subsets were included throughout the various sequences of the Minicourse. These behaviors are presented in Table VII. A discussion of teacher behavior changes within the treat-

TABLE VI

TEACHER BEHAVIOR CHANGE, PRE TO POST
TREATMENT PANEL (N=16)

Behavior	Pre-tape Mean	Post-tape Mean	Difference Pre to Post Mean	Difference Pre to Post S.D.	t_{15}
Grapheme Recognition					
1. Ask pupil to match letter with same letter.....	2.94	2.84	- .10	5.29	.09
2. Ask pupil to describe how two letters differ.....	2.13	2.33	.21	2.32	1.73
3. Ask pupil to find same letter in word.....	.38	1.40	1.02	2.03	2.01*
4. Ask pupil to tell where letter is in word.....	.44	2.84	2.40	2.68	3.59**
Grapheme/Phoneme Correspondence					
5. Pronounce and show word to illustrate correspondence	5.38	11.69	6.31	15.18	1.66
6. Write and pronounce word pupil suggested.....	.56	4.00	3.44	6.10	2.25*
7. Present word example for more than one sound of letter	.44	1.81	1.37	3.10	1.77*
Larger Letter Units					
8. Present similar spelling pattern words together.....	2.29	3.30	1.01	2.69	1.50
9. Ask pupil to identify similar spelling pattern.....	.81	1.88	1.07	1.22	3.03**
10. Present contrasting spelling pattern words together...	2.96	3.85	.89	2.66	1.33
11. Ask pupil to identify contrasting spelling pattern....	.33	1.67	1.34	1.26	4.25***
12. Present words with affixes sequentially.....	1.15	1.53	.38	1.50	1.02
13. Discuss how affix changes word meaning.....	.28	.88	.60	.77	3.11**
Contextual Clues					
14. Ask pupil to arrange words into sentence.....	.95	.94	- .01	.90	.03
15. Ask or tell about homograph duality.....	1.16	4.75	3.59	3.55	4.04***

***$t_{15,.001}=3.73$ **$t_{15,.01}=2.60$ *$t_{15,.05}=1.75$

TABLE VII

TEACHER BEHAVIOR CHANGE, PRE TO POST
TREATMENT PANEL (N=16)

Behavior	Pre-tape Mean	Post-tape Mean	Difference Pre to Post Mean	Difference Pre to Post S.D.	t_{15}
Teaching for Transfer					
16. Ask why or how pupil knew.....	.69	2.87	2.18	3.28	2.66**
17. Provide new word differing from previously presented word in only one letter.....	4.26	10.19	5.93	6.76	3.51**
18. Provide new word containing pattern resembling previously presented word....	2.09	5.13	3.04	4.26	2.84**
Response to Error					
19. Return to previously presented word....	.31	.19	- .12	.71	.70
20. Write pupil response; compare with target word.....	.19	.69	.50	1.10	1.83*
-21. Ignore error.....	.31	.19	- .12	.71	.70
-22. Move to another pupil for answer.....	2.25	1.00	-1.25	4.60	1.09
-23. Provide answer without allowing pupil trial.....	3.63	1.00	-2.63	7.16	1.47
Negative Behaviors					
-24. Say "Sound letter makes," or "Sound letter says".....	2.13	.69	-1.44	2.58	2.23*
-25. Pronounce isolated letter sounds.....	4.06	.75	-3.31	4.61	2.87**
-26. Ask pupil to pronounce isolated letter sounds.....	4.31	1.13	-3.19	6.04	2.11*
-27. Pronounce word with unnatural stress.....	16.81	6.50	-10.31	13.99	2.94*

-Behaviors expected to decrease pre to post

***$t_{15,.001}=3.73$ **$t_{15,.01}=2.60$ *$t_{15,.05}=1.75$

ment panel for each subset of behaviors follows.

Grapheme Recognition. While the mean frequency of the use of the behaviors related to teaching pupils to recognize individual letters increased, pre to post, on all four behaviors, the training appeared to have greatest effect upon the behaviors of showing a pupil a given letter and asking him to find the same letter in a word (Behavior 3), and upon the behavior of asking the pupil to tell whether the letter is at the beginning, middle or end of the word (Behavior 4). Of these two, the latter was more frequently used in the post-course lessons.

It should be noted that teachers tended to place less emphasis upon grapheme recognition in the post-course lessons than they had in the pre-course lessons. This was perhaps the result of increased pupil maturation, which would generally require less emphasis upon this skill.

Grampheme-Phoneme Correspondence. The mean gain in the use of behaviors related to teaching grapheme-phoneme correspondence was significant for two of the three behaviors in this subset. And, while the use of the behavior of pronouncing and showing the written form of a word to illustrate the grapheme-phoneme correspondence (Behavior 5) increased pre to post, the variation in the use of this behavior was great, i.e., some teachers used the behavior frequently, while other seldom used it.

The frequency of teachers' use of Behavior 6, writing and pronouncing a word a pupil suggested to illustrate the grapheme-phoneme correspondence, increased significantly pre to post. While teachers tended to pronounce the words suggested by pupils during the pre-course lessons, the training seemed to have "convinced" the teachers of the value of simultaneously pronouncing and writing the suggested word.

During the post-course lessons teachers tended to present word examples which illustrated more than one letter-sound correspondence for a given letter (Behavior 7). In addition to the gain in the frequency of use of this behavior, it was observed that during the post-course lessons teachers tended to emphasize the different correspondences for the same letter more than they had in the pre-course lessons.

Larger Letter Units. The training related to teaching grapheme-phoneme correspondence in larger letter units suggested that words which contain similar and contrasting spelling patterns be presented sequentially. For example, the word "bit" might be presented after the presentation of the words "hid" and "bid." Of the four teaching behaviors related to similar and contrasting patterns, Behaviors 8 through 11, two were "presenting" behaviors, and two were "asking" behaviors. It is interesting to note that, while the frequency of all four behaviors increased, Behaviors 9 and 11, where the teacher asked the pupil to identify the spelling pattern in a word, increased more than did the "presenting" behaviors.

The teachers' use of the behaviors related to dealing with affixes, Behaviors 12 and 13, showed little change pre to post. Even though the computed t value for the change in the use of Behavior 13 was statistically significant, such a degree of change (.60) is viewed as having little practical significance in affecting pupil learning.

Contextual Clues. A description of the section of the pre- and post-course lessons which related to contextual clues will, perhaps, best illustrate the changes in teacher behaviors in this subset. In both lessons, pupils were asked by their teachers to arrange randomly ordered

words into a sentence. The sentence contained the homograph "read" or "tear," which according to the way in which the sentence was arranged, could have one of two pronunciations or meanings.

The number of times the teachers asked pupils to arrange the words into a sentence (Behavior 14) did not change significantly pre to post. This result is not surprising when taken with the fact that most teachers had their pupils arrange the words into a sentence only once in both pre- and post-course lessons. At the same time, this result perhaps indicates that, for the group of teachers studied, the training sequence on contextual clues, which was designed to increase teachers' use of this behavior, was not effective since it encouraged teachers to have pupils rearrange the sentence at least twice in order to decode the homograph correctly. Although teachers did not have their pupils arrange the sentences more frequently after the training, the degree of change in Behavior 15, which dealt with the teachers' asking and/or telling about more than one pronunciation or meaning of the homograph contained in the sentence, showed a marked increase pre to post.

Teaching for Transfer. The behavior of asking a pupil why or how he knew that his response to a given stimulus was correct (Behavior 16) was viewed as a teaching behavior which could potentially help pupils to clarify their understanding of the underlying generalizations of the decoding process. The use of this behavior also provided opportunity for ongoing diagnosis of pupil understanding. And, because Behaviors 16 and 17 can aid pupils in forming generalizations based upon the similarities and differences in the spelling patterns of words, the behaviors in this subset were viewed as facilitating pupil transfer, or application, of decoding skills.

As indicated in Table VII, the training appeared to show a consistent effect upon teachers' increased use of the behaviors in this subset. (Computed *t* values for all three behaviors, 16, 17, and 18, were significant beyond the .01 level.)

Response to Error. In interpreting the change in teacher behavior relative to responding to pupil errors, it should be noted that inspection of the raw data from which the mean frequencies of teacher behavior were calculated indicated that pupils who were taught by the teachers in the post-course lessons made fewer errors than did the pupils instructed in the pre-course lessons. This fact, when considered with the data presented in Table VII under "Response to Error," indicates that, while fewer errors were made by pupils, teachers' use of the behavior of writing a pupil's erroneous response and comparing it with the correct response (Behavior 20) increased pre to post. As a group, teachers tended not to use the response of returning to a previously presented word (Behavior 19) to help the pupil to correct his error. Of the three types of responses to error which were expected to decrease as a result of the training, it was found that all three did in fact decrease, but not significantly.

Negative Behaviors. Four behaviors (24 through 27), which are frequently employed by teachers in presenting the grapheme-phoneme correspondence of individual letters, were labeled as "negative." Since the use of these behaviors tends to distort the actual correspondence of a given letter, the use of these behaviors was discouraged in the training sequences, and was, therefore, expected to decrease as a result of training. As predicted, the use of these four behaviors decreased signifi-

cantly, pre to post.

Hypotheses Two and Three: In-service and Preservice Teacher Behavior

The research question investigated in the first hypothesis, i.e., did the training affect the teaching behavior of teachers in the treatment panel, does not take into account the comparison of treatment and non-treatment panel teachers. Hypotheses two and three deal with such a comparison. As stated below, the comparison was first made between all in-service and preservice teachers in the treatment and non-treatment panels. In subsequent sections of the chapter, separate comparisons are made between the two panels of in-service teachers, and between the two panels of preservice teachers.

> The frequency of post-training teaching behaviors related to teaching reading decoding skills, adjusted by covariance for differences in pre-training teaching behavior, of two panels of in-service and preservice teachers (N=33) will be correlated in the expected direction to the treatment condition--training with Minicourse Eighteen.

Because the individual behaviors within a given subset of the behaviors studied are related to one another by the nature of their common task focus, the mean frequency of the use of a given behavior in the post-course lessons was adjusted, by a multiple partial correlation technique, for the frequency of the use of all behaviors in the same subset in the pre-course lessons. In this manner, each subset of behaviors was treated as an interactive system of behaviors which was directed toward a specific teaching task.

The model underlying the analysis employed is roughly analogous to multiple analysis of covariance. In multiple analysis of covariance, however, a separate covariance adjustment (multiple partialling) is performed to study between group differences. In the multiple partialling

technique employed in the present analysis, the post-course teaching behavior of both panels of teachers was adjusted by combining, or pooling, the within-group variances in the pre-course teaching behavior of each panel.

The relationship of the adjusted post-course teaching behavior to the treatment condition--training or no training with Minicourse Eighteen--was established by computing point biserial correlations (r_{pbis}) between covariance adjusted post-course behavior, a continuous variable, and the treatment condition, a dichotomous variable. The treatment condition was coded as either "1" (non-treatment) or "2" (treatment). Thus, a positive point biserial correlation for a given behavior which was expected to increase for treatment panel subjects, would indicate a relationship between adjusted post-course performance and the treatment condition in favor of the subjects trained with Minicourse Eighteen. Conversely, when a behavior was expected to decrease as a result of training, a negative correlation would be expected. (A negative correlation on a behavior expected to increase for subjects in the treatment panel would indicate more frequent use of that behavior by non-treatment panel subjects.)

Analysis of the data for this hypothesis was performed via the Bryant-Lohnes Statistical Package, which utilizes statistical subroutines by Cooley and Lohnes.[1] Computing was performed at the University Computing Center at the State University of New York at Buffalo. In Tables VIII and IX the point biserial correlations resulting from the analysis

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[1]William W. Cooley and Paul R. Lohnes, Multivariate Data Analysis, New York: John Wiley and Sons, 1971.

TABLE VIII

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE AND PRESERVICE TEACHERS (N=33)

Behavior	r_{pbis}
Grapheme Recognition	
1. Ask pupil to match letter with same letter.....	.12
2. Ask pupil to describe how two letters differ.....	.51
3. Ask pupil to find same letter in word.....	.23
4. Ask pupil to tell where letter is in word.....	.40
Grapheme/Phoneme Correspondence	
5. Pronounce and show word to illustrate g/p correspondence.....	.30
6. Write and pronounce word pupil suggested.....	.27
7. Present word examples for more than one sound of letter.....	.27
Larger Letter Units	
8. Present similar spelling pattern words together.....	.10
9. Ask pupil to identify similar spelling pattern.....	.04
10. Present contrasting spelling pattern words together.....	.14
11. Ask pupil to identify contrasting spelling pattern.....	.14
12. Present words with affixes sequentially.....	.08
13. Discuss how affix changes word meaning.....	.06
Contextual Clues	
14. Ask pupil to arrange words into sentence.....	-.11
15. Ask or tell about homograph duality.....	.47

TABLE IX

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE AND PRESERVICE TEACHERS (N=33)

Behavior	r_{pbis}
Teaching for Transfer	
16. Ask why or how pupil knew.....	.09
17. Provide new word differing from previously presented word in only one letter.....	.12
18. Provide new word containing pattern resembling previously presented word.....	.18
Response to Error	
19. Return to previously presented word.....	.07
20. Write pupil response; compare with target word.....	.33
*21. Ignore Error.....	-.10
*22. Move to another pupil for answer.....	.14
*23. Provide answer without allowing further pupil trial.....	-.30
Negative Behaviors	
*24. Say "Sound letter makes" or "Sound letter says".....	-.28
*25. Pronounce isolated letter sounds.....	-.50
*26. Ask pupil to pronounce isolated letter sounds.....	-.47
*27. Pronounce word with unnatural stress.....	-.21

*Behaviors expected to decrease, pre to post, among treatment panel teachers (Negative correlation to treatment expected)

are presented. The direction of the correlations indicates that, for twenty-five of the twenty-seven behaviors, the expected relationship was found between the frequency of teachers' use of the behaviors and the treatment--training with Minicourse Eighteen. The importance of this finding lies not only in the magnitude of the correlations reported, but in the consistency of the direction of the correlations. The reader is reminded that the use of correlational techniques with small sample size can result in capitalization on chance to produce "relationships" between variables. If this were the case with the present analysis, and no actual relationship existed between the treatment and adjusted post-course teaching behavior, less consistency in the direction of the correlations would be expected.

The fact that the treatment (Minicourse Eighteen) and adjusted post-course teaching behavior were correlated in the expected direction for all except two of the twenty-seven behaviors appears to indicate the consistency of treatment effects, i.e., the covariance adjusted frequency of use of twenty-five behaviors related to teaching reading decoding skills by in-service and preservice teachers in the treatment panel (N=16) was consistently different, in the expected direction, from the frequency of use of these behaviors by in-service and preservice teachers in the non-treatment panel (N=17). Thus, for the combined group of in-service and preservice teachers, the hypothesized directionality of the correlations was supported by the data for twenty-five of the twenty-seven behaviors.

The question of which subsets of behaviors had the strongest relationship to treatment was also investigated. An analysis was performed to compare the effects of the training upon teachers' use of all

behaviors within a given subset of behaviors. For this analysis, multiple point biserial correlations between post-course teaching behavior (with pre-course behavior partialled out) and the treatment condition were computed via the Bryant-Lohnes Statistical Package. In the present application, this type of analysis in effect predicts whether an individual teacher has received training with Minicourse Eighteen on the basis of the frequency of his use of all behaviors within each of the seven subsets of behaviors. Thus, the analysis resulted in seven multiple point biserial correlations, one for each subset of behaviors. The squared multiple correlations, if statistically significant to permit analysis of variance, would in turn indicate the percentage of variance in post-course teaching behavior (with pre-course behavior partialled out) which is associated with the treatment condition. Since the present investigation was conceived as a descriptive comparison of the behavior of two panels of teachers, the above statistics were not employed in an inferential sense. Rather the statistics were used to explore the relationships between teaching behavior and treatment for the panels of teachers studied.

The multiple point biserial correlations (R_{pbis}) resulting from the analysis of teachers' use of the behaviors in each subset are presented in Table X in the order of their magnitude. The magnitude of the correlations, which range from .18 to .68, was used as an indication of which subsets of behaviors had the strongest relationship to treatment for the panels of teachers studied. Comparison of the magnitude of the correlations for each subset of behaviors indicates that the adjusted post-course teaching behavior of treatment panel teachers differed most from the behavior of non-treatment panel teachers on behaviors related to

TABLE X

MULTIPLE CORRELATIONS BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE AND PRESERVICE TEACHERS (N=33)

Behavior Subset	R_{pbis}
1. Grapheme Recognition	.68
2. Negative Behaviors	.58
3. Contextual Clues	.47
4. Grapheme/Phoneme Correspondence	.42
5. Response to Error	.42
6. Larger Letter Units	.22
7. Teaching for Transfer	.18

teaching grapheme recognition (R=.68). Of the seven multiple correlations reported in Table X, only the squared multiple correlation between the treatment and the behaviors in the Grapheme Recognition subset (R^2=.46) is of sufficient significance to permit analysis of variance. This finding would indicate that forty-six percent of the variance in teachers' use of the behaviors in this subset in their post-course lessons was associated with the treatment condition.

A moderately strong association (R=.58) between treatment and adjusted post-course teaching behavior was noted in teachers' decreased use of negative behaviors. Thus, the training appeared to have a marked effect upon treatment panel teachers' less frequent use of negative behaviors in their post-course lessons.

While teachers' use of the behaviors related to teaching contextual clues was correlated .47 with the treatment, the primary contribution to this correlation appeared to be the treatment panel teachers' use of the behavior related to teaching homograph duality, Behavior 15. The effect of treatment upon teachers' use of behaviors related to teaching grapheme/phoneme correspondence, and behaviors related to response to error was approximately equal; the correlations between treatment and the behaviors in these two subsets being .42.

The teaching behavior of treatment and non-treatment panel teachers in the study appeared to differ least in the use of behaviors related to teaching grapheme/phoneme correspondence in larger letter units, and in the behaviors related to teaching for transfer. (R=.22 and .18 respectively.)

Hypothesis Two: Preservice Teacher Behavior

The combining of in-service and preservice teacher behavior data

in the previous hypothesis was undertaken to investigate the relationship between teacher behavior and the treatment condition for all teachers in the treatment and non-treatment panels. In an effort to assess possible differences in the effects of the training on the behavior of in-service and preservice teachers, the teaching behaviors of in-service and preservice teachers were compared separately. The present section deals with the comparison of the behavior of preservice teachers in the treatment and non-treatment panels. In the subsequent section, the behavior of the two panels of in-service teachers are compared.

Regarding the behavior of preservice teachers it was hypothesized that:

> The frequency of treatment and non-treatment panel preservice (N=19) teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills in post-course lesson videotapes, adjusted by covariance for differences in the frequency of use of these behaviors in pre-course lesson videotapes, will be correlated in the expected direction to the treatment condition--training with Minicourse Eighteen.

The data related to this hypothesis were analyzed by the sequence of multiple partial, point biserial and multiple correlational techniques described in the preceding section. Point biserial correlations between post-course teacher behavior (with pre-course behavior partialled out) and the treatment condition are reported in Tables XI and XII.

The resulting correlations indicate that for twenty-two of the twenty-seven behaviors, the post-course behavior of the nineteen preservice teachers in the treatment and non-treatment panels was correlated in the expected direction to the treatment condition. The preservice teachers in the non-treatment panel employed four of the behaviors in the Larger Letter Units subset, and one of the behaviors in the Contextual Clues subset more frequently than did the preservice teachers in the

TABLE XI

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: PRESERVICE TEACHERS (N=19)

Behavior	r_{pbis}
Grapheme Recognition	
1. Ask pupil to match letter with same letter.....	.38
2. Ask pupil to describe how two letters differ.....	.47
3. Ask pupil to find same letter in word.....	.31
4. Ask pupil to tell where letter is in word.....	.58
Grapheme/Phoneme Correspondence	
5. Pronounce and show word to illustrate g/p correspondence.....	.51
6. Write and pronounce word pupil suggested.....	.41
7. Present word examples for more than one sound of letter.....	.26
Larger Letter Units	
8. Present similar spelling pattern words together.....	.16
9. Ask pupil to identify similar spelling pattern.....	.10
10. Present contrasting spelling pattern words together.....	-.03
11. Ask pupil to identfy contrasting spelling pattern.....	-.04
12. Present words with affixes sequentially.....	-.07
13. Discuss how affix changes word meaning.....	-.08
Contextual Clues	
14. Ask pupil to arrange words into sentence.....	-.06
15. Ask ot tell about homograph duality.....	.62

TABLE XII

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: PRESERVICE TEACHERS (N=19)

Behavior	r_{pbis}
Teaching for Transfer	
16. Ask why or how pupil knew.....	.06
17. Provide new word differing from previously presented word in only one letter.....	.16
18. Provide new word containing pattern resembling previously presented word.....	.04
Response to Error	
19. Return to previously presented word.....	.23
20. Write pupil response; compare with targe word.....	.20
*21. Ignore Error.....	-.00
*22. Move to another pupil to answer.....	-.09
*23. Provide answer without allowing further pupil trial.....	-.16
Negative Behaviors	
*24. Say "Sound letter makes" or "Sound letter says".....	-.35
*25. Pronounce isolated letter sounds.....	-.50
*26. Ask pupil to pronounce isloated letter sounds.....	-.52
*27. Pronounce word with unnatural stress.....	-.26

*Behaviors expected to decrease, pre to post, among treatment panel teachers (Negative correlation to treatment expected)

treatment panel, thus accounting for the five behaviors which did not correlate to treatment in the expected direction.

All correlations for the behaviors in the Grapheme Recognition, Grapheme/Phoneme Correspondence, Teaching for Transfer, Response to Error, and Negative Behaviors subsets were in the expected direction. Again, the consistency of directionality for twenty-two of the twenty-seven behaviors is viewed as an important finding for the reasons cited in the preceding section. When the correlations between teacher behavior and treatment are interpreted with the realization that treatment panel teachers participated in approximately twenty clock hours of actual training, the importance of this finding becomes more evident.

Multiple point biserial correlations between treatment and preservice teachers' use of the behaviors within each subset, which are reported in Table XIII in the order of their magnitude, range between .23 and .74. Of the seven subsets of behaviors, preservice teachers' use of the behaviors related to teaching grapheme recognition appeared to be the best predictor of treatment (R=.74). The frequency of use of the behaviors in the Negative Behaviors subset also appeared to be strongly related to treatment (R=.70).

Treatment panel preservice teachers' use of the behavior dealing with homograph duality (Behavior 15) again appeared to contribute most to the multiple correlation of .62 between the use of behaviors in the Contextual Clues subset and the treatment condition. The use of behaviors in the Grapheme/Phoneme Correspondence subset by preservice teachers appeared to be a moderately strong predictor of treatment (R=.53), while the use of behaviors in the Response to Error, Teaching for Transfer, and Larger Letter Units subsets did not appear to be strongly

TABLE XIII

MULTIPLE CORRELATIONS BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: PRESERVICE TEACHERS (N=19)

Behavior Subset	R_{pbis}
1. Grapheme Recognition	.74
2. Negative Behaviors	.70
3. Contextual Clues	.62
4. Grapheme/Phoneme Correspondence	.53
5. Response to Error	.28
6. Larger Letter Units	.23
7. Teaching for Transfer	.23

related to treatment for the panel of preservice teachers studied. Multiple correlations between these behavior subsets and the treatment were .28, .23, and .23 respectively.

It will be noted that the adjusted post-course teaching behavior of preservice teachers for each subset of behaviors is correlated to the treatment in the same order of magnitude as the behaviors of in-service and preservice teachers combined. For example, for both in-service and preservice teachers combined, and for preservice teachers only, the highest multiple correlation was found between the Grapheme Recognition subset and the treatment. In both cases, the lowest relationship to treatment was found for behaviors in the Teaching for Transfer subset. This finding, when taken with the fact that, with one exception, the magnitudes of the multiple correlations are greater for preservice teachers than for in-service and preservice teachers combined, indicates that preservice teachers' behavior contributed more to the correlations for the combined group than did the behavior of in-service teachers.

Hypothesis Three: In-service Teacher Behavior

The pupil performance phase of the study, which is described in the next section of the chapter, utilized data derived from pupils in the classes of in-service teachers in the treatment and non-treatment panels. Because preservice teachers in the study did not have any interaction with the pupils studied, it is important to compare the teaching behavior of the two panels of in-service teachers separately. Regarding this comparison, it was hypothesized that:

> The frequency of treatment and non-treatment panel in-service teachers' (N=14) use of twenty-seven specific behaviors related to teaching reading decoding skills in post-course lesson videotapes, adjusted by covariance for differences in the frequency

of use of these behaviors in pre-course lesson videotapes, will be correlated in the expected direction to the treatment condition--training with Minicourse Eighteen.

Data pertaining to this hypothesis were analyzed by the method described in the preceding sections. The resulting point biserial correlations between adjusted post-course teaching behavior and the treatment condition are presented in Tables XIV and XV. Inspection of the tables indicates that the teaching behavior of the seven in-service teachers in the treatment panel was not consistently different in the expected direction from the behavior of the seven in-service teachers in the non-treatment panel in the use of all twenty-seven behaviors. The resulting correlations indicate that for ten behaviors the direction of correlation favors the non-treatment panel, i.e., non-treatment panel in-service teachers used ten of the twenty-seven behaviors more frequently in post-course lessons than did treatment panel in-service teachers. Thus, the hypothesized directionality was supported by the data analysis for only seventeen of the twenty-seven behaviors.

The results of the multiple correlation analysis of in-service teacher behavior data are reported in Table XVI. The multiple correlations, which range from .11 to .67, are reported in the order of their magnitude, thus indicating the order of the strength of relationship between post-course use of the behaviors in each subset and the treatment condition.

It can be seen that in-service teachers in the treatment panel differed most from in-service teachers in the non-treatment panel in their use of behaviors related to response to error (R=.67), and in their use of behaviors related to teaching grapheme recognition (R=.64). Of the seven subsets of behaviors, the use of behaviors in the Grapheme

TABLE XIV

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE TEACHERS (N=14)

Behavior	r_{pbis}
Grapheme Recognition	
1. Ask pupil to match letter with same letter.....	-.02
2. Ask pupil to describe how two letters differ.....	.52
3. Ask pupil to find same letter in word.....	.07
4. Ask pupil to tell where letter is in word.....	.08
Grapheme/Phoneme Correspondence	
5. Pronounce and show word to illistrate g/p correspondence.....	.08
6. Write and pronounce word pupil suggested.....	-.03
7. Present word examples for more than one sound of letter.....	.19
Larger Letter Units	
8. Present similar spelling pattern words together.....	-.10
9. Ask pupil to identify similar spelling pattern.....	-.03
10. Present contrasting spelling pattern words together.....	-.14
11. Ask pupil to identify contrasting spelling pattern.....	-.04
12. Present words with affixes sequentially.....	.20
13. Discuss how affix changes word meaning.....	-.06
Contextual Clues	
14. Ask pupil to arrange words into sentence.....	-.04
15. Ask or tell about homograph duality.....	.11

TABLE XV

CORRELATION BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE TEACHERS (N=14)

Behavior	r_{pbis}
Teaching for Transfer	
16. Ask why or how pupil knew.....	.02
17. Provide new word differing from previously presented word in only one letter.....	.12
18. Provide new word containing pattern resembling previously presented word.....	.39
Response to Error	
19. Return to previously presented word.....	.00
20. Write pupil response; compare with target word.....	.27
*21. Ignore Error.....	.03
*22. Move to another pupil for answer.....	.47
*23. Provide answer without allowing further pupil trial.....	-.48
Negative Behaviors	
*24. Say "Sound letter makes" or "Sound letter says".....	-.09
*25. Pronounce isolated letter sounds.....	-.44
*26. Ask pupil to pronounce idolated letter sounds.....	-.43
*27. Pronounce word with unnatural stress.....	-.37

*Behaviors expected to decrease, pre to post, among treatment panel teachers (negative correlation to treatment expected)

TABLE XVI

MULTIPLE CORRELATIONS BETWEEN ADJUSTED POST-COURSE TEACHER BEHAVIOR AND TREATMENT: IN-SERVICE TEACHERS (N=14)

Behavior Subset	R_{pbis}
1. Response to Error	.67
2. Grapheme Recognition	.64
3. Negative Behaviors	.50
4. Larger Letter Units	.48
5. Teaching for Transfer	.40
6. Grapheme/Phoneme Correspondence	.31
7. Contextual Clues	.11

Recognition subset appeared to be the strongest predictor of treatment in the two previous comparisons, i.e., in-service and preservice combined, and preservice only. For in-service teachers in the study, the use of behaviors in the Response to Error subset appeared to be most strongly associated with treatment, followed next by the use of behaviors in the Grapheme Recognition subset. Treatment panel in-service teachers' use of Behavior 2, asking a pupil to describe how two letters differ in shape, appeared to contribute heavily to the resulting multiple correlation between the use of grapheme recognition behaviors and treatment.

The correlation between treatment and in-service teachers' decreased use of negative behaviors (R=.50) also indicated a substantial association between training and teacher behavior. It will be recalled that the decreased use of negative behaviors also appeared as a good predictor of treatment in the previous two comparisons.

While the use of behaviors in the Larger Letter Units subset appeared to have a moderately strong association (R=.48) with treatment, the direction and magnitude of the point biserial correlations for individual behaviors in this subset (See Table XIV) indicate that the strongest contribution to the multiple correlation for this subset was made by treatment panel teachers' use of Behavior 12, presenting words with affixes sequentially.

In-service teachers' use of behaviors related to teaching for transfer correlated .40 with the treatment condition; the largest contribution to the multiple correlation being the treatment panel teachers' use of Behavior 18, providing a new word containing a spelling pattern resembling the pattern in a previously presented word. The multiple correlation of .31 for use of behaviors in the Grapheme-Phoneme Corre-

spondence subset indicates only a moderate relationship of the use of these behaviors to the treatment condition for the in-service teachers studied.

Regarding the behaviors in the Contextual Clues subset, it is apparent from the low (.11) multiple correlation that the training had only a very limited effect on the increased used of these behaviors by in-service teachers in the treatment panel.

PUPIL PERFORMANCE

In addition to studying changes in teacher behavior in relation to Minicourse Eighteen, it was felt that the efficacy of using the course as a teacher training device should be further determined by studying pupil performance in reading.

Two reading subtests of a standardized achievement test, and a forty-eight item, non-standardized test of reading decoding skills were administered to pupils two weeks before and four weeks after the training of teachers to determine whether differences existed between the performance of pupils in the classes of in-service teachers trained with Minicourse Eighteen, and pupils in the classes of teachers who did not receive the training. Parallel forms of the Stanford Achievement Test, Primary Battery I or II, "Paragraph Meaning" and "Word Study Skills" subtests were administered fourteen weeks apart to second and third grade pupils (N=92) taught by teachers who had participated in the training, and to second and third grade pupils (N=93) in the classes of teachers who did not receive the training. Equivalent forms of the Minicourse Eighteen Achievement Test were administered, pre and post, to all first, second, and third grade pupils in the classes of teachers in the treat-

ment (N=115) and non-treatment (N=115) panels.

Hypothesis Four: Stanford Achievement Test; Subtest Performance

It was hypothesized that:

> The covariance adjusted post-test mean grade equivalent score on the "Paragraph Meaning" and "Word Study Skills" subtest of the Stanford Achievement Test will be significantly greater for second and third grade pupils in the classes of in-service teachers trained with Minicourse Eighteen than the adjusted mean grade equivalent score of second and third grade pupils in the classes of in-service teachers not trained with Minicourse Eighteen.

Pre- and post-test grade equivalent scores on the Stanford "Paragraph Meaning" (PM) and "Word Study Skills" (WSS) were analyzed by multivariate analysis of multiple covariance, with pre-test performance on both subtests as the covariates, and adjusted post-test performance on both subtests as the criterion. Computations were performed via the NYBMUL Multivariance Program, Version 5.

Pre- and post-test means and standard deviations for both panels of pupils are presented in Table XVII. Although there were no a priori reasons to expect differences in the pre-test performance of the two panels of pupil subjects, the data in Table XVII indicate that the mean grade equivalent score of the treatment panel on the PM subtest was approximately two months higher than the mean grade equivalent score of the non-treatment panel. A difference of three months was also found between the treatment and non-treatment panels' mean grade equivalent scores on the WSS subtest. Such differences would tend to bias the results of analysis of variance. However, the statistical model employed in the present analysis (covariance), in effect, adjusts the criterion measure (post-test) for pre-test differences.

The observed difference between treatment and non-treatment panels' mean post-test scores for the PM subtest was four months, while

TABLE XVII

PRE- AND POST-TEST MEANS AND STANDARD DEVIATIONS:
STANFORD SUBTESTS

	Paragraph Meaning		Word Study Skills	
	Mean	S.D.	Mean	S.D.
PRE-TEST				
Treatment (N=92)	2.31	.71	2.52	1.31
Non-Treatment (N=93)	2.08	.68	2.21	.89
Difference	.23		.31	
POST-TEST				
Treatment (N=92)	2.85	.90	3.11	1.42
Non-Treatment (N=93)	2.48	.81	2.53	1.05
Difference	.37		.58	

the difference between the groups for the WSS subtest was six months. Expected gain, as a function of maturation and instruction, for the fourteen week test-retest interval would be three and one-half months (.35) for both groups if they were closely representative of the norming population. The observed mean gain, pre to post, for the treatment panel was .54 on the PM subtest, and .59 on the WSS subtest. For the non-treatment panel, observed mean gain on the PM subtest was .40 and .32 on the WSS subtest.

Intercorrelations between pre- and post-test performance on both subtests of treatment and non-treatment panel subjects combined (N=185), are presented in Table XVIII. The correlations between pre and post performance on the same subtest provide an indication of the subtest reliabilities for the panel of subjects studied. The resulting correlations of .85 for both subtests approximate the test publisher's reported reliabilities (split-half) of .93 for both subtests. (Publisher's reliabilities were based upon the performance of one thousand subjects who comprised the norming sample.) The difference between the reported reliability and the reliability for the sample data is likely the result of different methods of determination, treatment effects, and smaller sample size.

The importance of using both subtests as multiple covariates in the analysis is illustrated by the intercorrelations between the PM and WSS subtests. The correlations of .70 for the pre-test and .67 for the post-test indicate that performance on both subtests is interrelated to a high degree.

The assumption of linearity between pre-test and post-test scores for the combined groups was tested by regression analysis. The hypothe-

TABLE XVIII

INTERCORRELATIONS AMONG PRE- AND POST-TEST SCORES ON THE STANFORD "PARAGRAPH MEANING" AND "WORD STUDY STILLS" SUBTESTS (N=185)

	PRE-PM	PRE-WSS	POST-PM	POST-WSS
PRE-PM	1.00			
PRE-WSS	.70	1.00		
POST-PM	.85	.62	1.00	
POST-WSS	.69	.85	.67	1.00

sis of no association between dependent and independent variables was rejected at a high level of significance ($p < .0001$) for both the univariate (each subtest separately) and the multivariate case (both subtests combined). Canonical correlation analysis between pre-test scores on both subtests and post-test scores on both subtests indicated the fifty-nine percent of the variation in post-test performance was associated with pre-test performance.

The assumption of homogeneity of regression was tested to determine whether the results of the covariance analysis would be biased by between group differences in pre-test performance. The test of homogeneity of regression resulted in the failure to reject the null hypothesis that within group regression coefficients are equal. ($F=.912$, $df=4,356$, $p < .46$).

With the assumptions of linearity and homogeneity of regression having been verified for the data, multivariate analysis of multiple covariance was employed to investigate the hypothesized difference between the performance of treatment and non-treatment panel subjects. The F ratio for the multivariate test of equality of mean vectors was significant beyond the .05 level ($F=4.22$, $df=2,180$, $p < .017$). This finding indicates that the post-test performance of treatment panel subjects on the Stanford PM and WSS subtests, adjusted by covariance for between group differences on the pre-test, was superior to non-treatment panel subjects' performance on these subtests. Thus, Hypothesis Four was supported by the data analysis.

The contirbution of each subtest to the multivariate F ratio is illustrated in Table XIX. It can be seen that the univariate F value of 3.64 for the PM subtest did not reach the .05 level of significance

TABLE XIX

ANALYSIS OF COVARIANCE FOR STANFORD SUBTEST

	Mean Square Between	Mean Square Within	Univariate F	Step-down F
Paragraph Meaning	75.85	20.82	3.64	3.64
Word Study Skills	272.81	40.72	6.70**	4.73*
df =	1	181		

*p < .05

**p < .01

($F_{1,181,.05}=3.90$). Differences in performance on the WSS subtest were significant at the .01 level, indicating that performance on this subtest was the larger contributor to the multivariate F ratio. The contribution of the WSS subtest was further verified by the step-down F test, the results of which are reported in the last column of Table XIX. With the effects of performance on the PM subtest removed, the difference between the two groups in performance on the WSS subtest was still significant ($p < .031$).

The finding that performance on the "Word Study Skills" subtest contributed most to the between group differences on both subtests combined is consistent with the nature of the training provided to treatment panel teachers. In Minicourse Eighteen the primary emphasis was upon developing teacher behaviors which aid pupils in the acquisition of reading decoding skills. The items in the "Word Study Skills" subtest require the pupil to apply his knowledge of the decoding process.

The adjusted criterion means for the treatment and non-treatment panel subjects' performance on both subtests are presented in Table XX. In addition to the statistical significance of the difference between adjusted post-test means, the difference is also viewed as having practical significance. If, for example, it were found in a replication study that, over a fourteen week period, pupils in the classes of teachers trained with Minicourse Eighteen were one and one-third months superior in the ability measured by the Stanford "Paragraph Meaning" subtest, and two and one-half months superior in the ability measured by the "Word Study Skills" subtest, when compared to pupils in the classes of teachers who did not receive the training, adequate justification for training teachers to use the behaviors in Minicourse Eighteen would exist.

TABLE XX

ADJUSTED CRITERION MEANS: STANFORD SUBTESTS

	Treatment	Non-Treatment	Difference	
			Mean	S.D.
Paragraph Meaning	2.73	2.60	.13	.28
Word Study Skills	2.95	2.70	.25	.39

Hypothesis Five: Minicourse Eighteen Achievement Test Performance

In order to further investigate the differences between the performance of pupils in the treatment and non-treatment panels, parallel forms of a forty-eight item, non-standardized performance test of reading decoding skills were administered, pre and post, to all first, second and third grade pupils. Both forms of the Minicourse Eighteen Achievement Test (M18AT) included fifteen grapheme recognition items, nineteen grapheme/phoneme correspondence for single letters items, eight grapheme/phoneme correspondence for larger letter units items, and four contextual clues items. Each item was scored on a pass-fail basis, resulting in a raw score for the total test which included the combined scores on all subtests. Since the test was being used experimentally, and no norming data pertaining to it were available, the total scores served as an index of comparison between the two groups, but did not yield grade equivalent scores.

As an indication of test reliability, the total scores of the 230 first, second and third grade subjects were correlated, resulting in a correlation of .78 between pre-test and post-test scores.

Regarding the comparison of the performance of treatment and non-treatment panel subjects on this test it was hypothesized that:

> The covariance adjusted post-test mean score on the reading decoding tasks of the Minicourse Eighteen Achievement Test will be significantly greater for pupils in the classes of in-service teachers trained with Minicourse Eighteen than the adjusted post-test mean score of pupils in the classes of teachers not trained with Minicourse Eighteen.

A preliminary correlational analysis of the data related to this hypothesis indicated that: (1) scores on the four subtests were not sufficiently interrelated to warrant the use of multivariate analysis of sub-

test scores; and (2) reliabilities of the individual subtests were not of sufficient magnitude to justify analysis of subtest scores. (Intercorrelations between pre- and post-test scores on each subtest for all 230 subjects are reported in Appendix D.)

As a result of the above findings, univariate analysis of variance and covariance, with the pre-test score as the covariate, were employed to investigate the hypothesis. Subjects' total scores resulting from the combined scores on the four subtests, were used in the analysis. Computations were performed via the NYBVAC one-way analysis of variance and covariance computer program.

Tests of the assumptions of homogeneity of variance and homogeneity of regression were performed. Homogeneity of variance on the criterion measure was tested by the use of Bartlett's Test. The resulting chi square value of .2305, which was not significant ($\chi^2_{1,.05}=3.84$), indicated that the assumption of homogeneous variance had been met by the data. The test of homogeneity of regression resulted in the failure to reject the null hypothesis that within-group regression coefficients are equal ($F=3.18$, $df=1,226$, $p < .05$). Thus, both of these enabling assumptions were met.

Pre- and post-test means and standard deviations, and adjusted criterion means for the treatment and non-treatment panels are presented in Table XXI.

Analysis of variance was used to determine whether treatment (N=115) and non-treatment (N=115) pupils' pre-test scores on the M18AT were significantly different. As illustrated in Table XXII, the non-significant F ratio (.22) resulting from the analysis of variance indicates that the pre-test performance of the two groups was not signifi-

TABLE XXI

PRE- AND POST-TEST MEANS, STANDARD DEVIATIONS AND ADJUSTED CRITERION MEANS: MINICOURSE EIGHTEEN ACHIEVEMENT TEST

	Pre-Test		Post-Test		Adjusted Criterion
	Mean	S.D.	Mean	S.D.	Mean
Treatment Panel	34.88	9.49	40.68	5.35	40.55
Non-Treatment Panel	34.32	8.85	38.19	5.11	38.32

TABLE XXII

ANALYSIS OF VARIANCE FOR BETWEEN GROUP DIFFERENCES ON PRE-TEST: MINICOURSE EIGHTEEN ACHIEVEMENT TEST

Source	df	Sum of Squares	Mean Square	F1,228
Between	1	17.81	17.81	.22*
Within	228	18663.39	81.86	
Total	229	18681.20		

*Non-significant ($F_{1,228,.05}=3.89$)

cantly different, i.e., treatment and non-treatment subjects did not initially represent populations of different ability in the decoding skills measured by the M18AT.

While the two groups did not differ significantly in their pre-test performance, results of analysis of covariance, Table XXIII, indicated a significant ($p < .0001$) difference on adjusted post-test performance. Adjusted criterion means for the treatment and non-treatment panel subjects were 40.55 and 38.32 respectively.

Although the data support the hypothesized difference between the two panels of subjects, further interpretation of the results is necessary. The observed raw score mean difference between the two groups' post-test performance indicates that treatment panel subjects correctly completed approximately two and one-half more items than did the non-treatment panel subjects, while the difference between criterion means was about two and one-quarter items. It is possible that if treatment panel subjects became familiar with the type of items in the test as a result of their teacher's use of the behaviors in Minicourse Eighteen, the test would, in effect, be measuring familiarity with the test items rather than underlying decoding abilities. And, while the data clearly indicate that the difference in the pre-test performance of the two groups was negligible, the possibility of the rival hypothesis for the post-test difference must be considered.

Hypothesis Six: Treatment Panel Performance on Word Study Skills Subtest

The preceding sections of the chapter dealt with the comparison of treatment and non-treatment panel pupils' performance. In order to investigate the nature of changes in the performance of treatment panel subjects, the distributions of their pre- and post-test scores on the

TABLE XXIII

ANALYSIS OF COVARIANCE FOR BETWEEN GROUP DIFFERENCES: MINICOURSE EIGHTEEN ACHIEVEMENT TEST

Source	df	Sum of Squares	Mean Square	$F_{1,227}$
Between	1	286.07	286.07	28.05*
Within	227	2314.77	10.20	
Total	228	2600.85		

*$p < .0001$

Stanford "Word Study Skills" subtest were compared.

The major emphasis in Minicourse Eighteen was upon the development of teacher behaviors related to teaching reading decoding skills. Because less able readers frequently lack these decoding skills, it was hypothesized that among treatment panel pupils, those who scored lowest on the pre-test would receive greater benefit from their teachers' training with Minicourse Eighteen. It was felt that pupils in the classes of teachers trained with Minicourse Eighteen who scored higher on the pre-test would receive less benefit since it would be likely that they had already mastered many of the skills to which the teacher training was directed.

Hypothesis Six was conceived as a means of assessing the effect of the training upon pupils of varying ability in decoding. Because dividing the subjects into high-and low-scoring groups on the basis of their pre-test scores would have resulted in capitalization upon regression of scores toward the mean, the distribution of the total group of subjects' scores was studied. If the teacher training affected less able pupils most, a curve representing the distribution of post-test scores would be expected to be less positively skewed than a curve representing the pre-test distribution of scores. Consequently, it was hypothesized that:

> The distribution of post-test scores on the "Word Study Skills" subtest of the Stanford Achievement Test of second and third grade pupils in the classes of in-service teachers trained with Minicourse Eighteen will demonstrate less positive skewness than the distribution of their pre-test scores on the subtest.

The pre- and post-test grade equivalent scores of second and third grade pupils in the treatment panel (N=92) were analyzed via the "Codebook" subroutine of the Statistical Package for the Social Sciences computer program. The resulting frequencies of each grade equivalent

score value were used to plot frequency polygons of the pre- and post-test scores. The curves based upon these polygons, Figure 2, illustrate the change in the distribution of scores between the pre- and post-test. In Table XXIV the moments of the distributions are presented.

While the distribution of both the pre- and post-test grade equivalent scores were positively skewed, the post-test distribution was less positively skewed. The resulting moment of skew for the pre-test distribution (1.92) when compared with the skew of the post-test distribution (1.35) also illustrates the less positive skew of the post-test distribution.

Only minor change was noted in the right tail of the distribution between pre- and post test. At the same time, significant change was noted in the left tail. When considered with the more platykurtic shape of the post-test distribution, these findings tend to indicate that the teacher training had greater effect upon the less able pupils in the treatment panel.

Because the scores of the total group of second and third-grade pupils in the treatment panel were combined, the left tail of the distributions contain the scores of second-grade pupils scoring at grade level, and the scores of third-grade pupils scoring below grade level. If pupil skill in decoding, as measured by the Stanford "Word Study Skills" subtest, is considered as a continuum, the fact that a "low" score was attributed to a second or third-grade pupil appeared to make little difference, i.e., low-scoring third-grade pupils appeared to contribute as much to the change in the shape of the distribution as did second-grade pupils scoring at grade level. Thus, it appears that the teacher behaviors included in Minicourse Eighteen might be equally appropriate for both

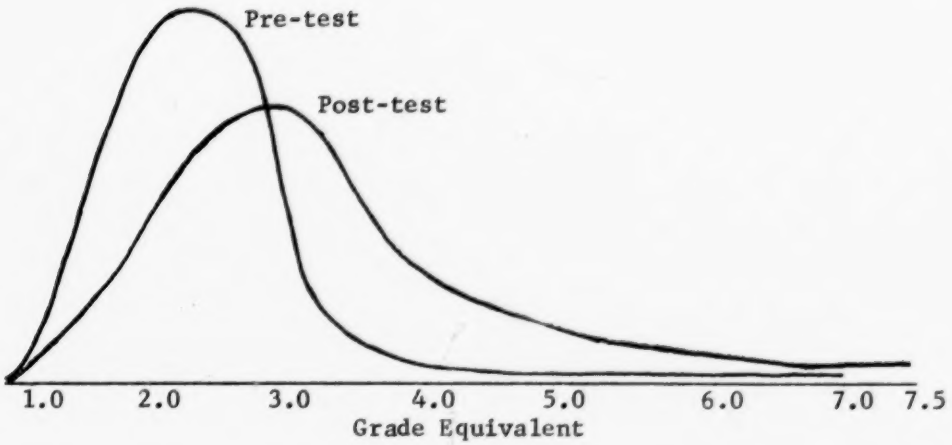

Figure 2

PRE- AND POST-TEST DISTRIBUTION OF SECOND AND THIRD GRADE TREATMENT PANEL PUPILS' (N=92) GRADE EQUIVALENT SCORES ON STANFORD "WORD STUDY SKILLS" SUBTEST.

TABLE XXIV

MOMENTS OF THE DISTRIBUTION OF TREATMENT PANEL PUPILS' GRADE EQUIVALENT SCORES ON THE STANFORD "WORD STUDY SKILLS" SUBTEST

	Mean	S.D.	Mode	Median	Kurtosis	Skew
Pre-Test	2.52	1.31	2.00	2.00	3.17	1.92
Post-Test	3.11	1.41	2.80	2.78	1.47	1.35

developmental and remedial reading instruction.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

There is, at present, ample evidence of the need for increased teacher effectiveness in providing reading instruction. This need is particularly apparent when the percentage of children who fail to learn to read adequately is considered. Additional indication of the necessity of increasing teacher effectiveness has also been provided by the findings of the Harvard-Carnegie Reading Studies, the First and Second Grade Cooperative Reading Studies, and by numerous educators who have explicitly stated this need.

Minicourse Eighteen, the subject of the present investigation, was designed to improve teacher effectiveness in aiding children in their acquisition of reading decoding skills. The research procedures employed in the investigation were designed to assess the effects of training with Minicourse Eighteen on the teaching behavior of two panels of in-service and preservice teachers. The effects of the training were also investigated in relation to pupil performance on reading decoding tasks. Thus, in an attempt to investigate the efficacy of using Minicourse Eighteen as a teacher training device, the dual criteria of teacher behavior and pupil performance were applied.

SUMMARY

Teacher Behavior

A non-equivalent control group design was employed in the study of teacher behavior in relation to Minicourse Eighteen training. Seven primary grade in-service teachers, and nine preservice teacher interns, who comprised the treatment panel, participated in the training with Minicourse Eighteen. Seven primary grade in-service teachers from the same city school district, and ten preservice teachers were assigned to non-treatment procedures and served as the source of control group data.

All thirty-three teacher subjects taught a twenty to thirty-minute lesson on reading decoding skills to three pupils one week before and two weeks after the training of treatment panel teachers. Pre- and post-course lessons were videotaped and subsequently analyzed, double blind, by eight trained raters to determine the frequency of teachers' use of twenty-seven specific behaviors related to teaching reading decoding skills.

Hypothesis One. Comparison of the pre- and post-course teaching behavior of the sixteen in-service and preservice teachers trained with Minicourse Eighteen indicated that the change in teaching behavior was in the direction expected for twenty-four of the twenty-seven behaviors rated. The *t*-test for correlated means was applied to the data to determine the significance of the difference between the mean frequency of treatment panel teacher's use of the twenty-seven behaviors in their pre- and post-course lessons. It was found that the amount of mean change was statistically significant ($p < .05$) for sixteen of the behaviors.

To aid the presentation and interpretation of the teacher behav-

ior data, the twenty-seven behaviors were grouped into seven subsets of behaviors. Each subset included behaviors appropriate to a particular teaching task. Significant changes were found for behaviors within each of the seven subsets, although the greatest consistency of change was noted in teaching behaviors which were designed to facilitate pupil transfer, or application, of decoding skills, and in the reduction of teaching behaviors which tend to misrepresent the actual grapheme/phoneme correspondence of individual letters.

Hypotheses Two and Three. The teaching behavior of the sixteen in-service and preservice teachers who participated in Minicourse Eighteen training was compared with the teaching behavior of the seventeen in-service and preservice teachers who did not receive the training. For this comparison, point biserial correlations between the treatment condition (training vs. no training) and covariance-adjusted post-course teaching behavior were computed. Results of the analysis indicated that the frequency of teacher's use of twenty-five of the twenty-seven behaviors in their post-course lessons was associated with the treatment, i.e, the adjusted frequency of use of twenty-five behaviors by teachers who had been trained with Minicourse Eighteen was consistently different, in the expected direction, from the behavior of teachers who did not receive the training.

Multiple point biserial correlations between the use of all of the behaviors in each of the seven subsets and the treatment condition ranged between .18 and .68. Comparison of the magnitudes of the multiple correlations for each subset of behaviors indicated that treatment panel teachers differed most from non-treatment panel teachers in their use of the behaviors related to teaching grapheme recognition, and in their

decreased use of negative behaviors. A moderately strong association was also noted between the treatment condition and the use of the behaviors in the Contextual Clues, Grapheme/Phoneme Correspondence, and Response to Error subsets. For the Larger Letter Units and Teaching for Transfer subsets, a low association was found between treatment and post-course teaching behavior.

Hypothesis Two. The comparison of the teaching behavior of the two panels of preservice teachers indicated that post-course teaching behavior was associated with the treatment (Minicourse Eighteen) for twenty-two of the twenty-seven behaviors rated. Multiple point biserial correlations for the seven behavior subsets ranged between .23 and .74. The magnitudes of the multiple correlations indicated that substantial differences existed between treatment and non-treatment panel teachers' use of the behaviors in four of the subsets. The use of the behaviors in the reamining three subsets did not appear to discriminate to a high degree between preservice teachers who had received the training and those who had not.

It was found that preservice teachers' use of the behaviors in each of the seven subsets was correlated to the treatment in the same order of magnitude as the use of the behaviors in each subset by in-service and preservice teachers combined.

Hypothesis Three. The adjusted post-course teaching behavior of the seven in-service teachers who had participated in the training with Minicourse Eighteen was compared with the teaching behavior of the seven in-service teachers who did not receive the training. The expected relationship between treatment and post-course teaching behavior was found

for seventeen of the twenty-seven behaviors. The range of the seven multiple point biserial correlations was between .11 and .67. The strongest association with the treatment was found for the use of behaviors in the Response to Error and Grapheme Recognition subsets. The multiple correlation for the Negative Behaviors subset indicated that the training had a moderately strong effect upon treatment panel teachers' decreased use of teaching behaviors which distort the grapheme/phoneme correspondence of individual letters.

Pupil Performance

Two hundred and thirty, first, second, and third grade pupils in the classes of the fourteen in-service teachers in the treatment and non-treatment panels served as subjects for the pupil performance phase of the investigation. Parallel forms of the "Word Study Skills" and "Paragraph Meaning" subtests of the Stanford Achievement Test were administered to all second and third grade pupils (N=185) two weeks before and four weeks after the teacher training. The Minicourse Eighteen Achievement Test was administered pre and post to all first, second, and third grade subjects (N=230). Comparisons were made between the performance of pupils whose teachers had been trained with Minicourse Eighteen, and pupils in the classes of teachers who had not received the training.

Hypothesis Four. Multivariate analysis of multiple covariance of grade equivalent scores, with the pre-test performance on both Stanford subtests as the covariates, and adjusted post-test performance as the criterion, was employed to investigate between group differences in pupil performance. A statistically significant ($p < .05$) difference indicated the superiority of the performance of pupils in the classes of

teachers trained with Minicourse Eighteen. Univariate analysis of covariance indicated that between group differences were significant beyond the .01 level for the "Word Study Skills" subtest, while the differences in performance on the "Paragraph Meaning" subtest approached, but did not reach, significance at the .05 level.

Hypothesis Five. Univariate analysis of covariance was used to compare the performance of treatment and non-treatment panel pupils on the Minicourse achievement test. A significant (.0001) difference was found; again demonstrating that pupils taught by teachers who had completed Minicourse Eighteen training made significantly greater gains in reading decoding ability. It was noted, however, that the superior gain of treatment panel pupils on the Minicourse test may have been partly attributed to greater familiarity with the tasks required by the test items.

Hypothesis Six. In order to assess the effects of the teacher training on the performance of high- and low-scoring pupils in the treatment panel, the distributions of their pre- and post-test grade equivalent scores on the Stanford "Word Study Skills" subtest were compared. It was found that the training appeared to benefit less able pupils most since the distribution of post-test scores exhibited less positive skewness and was more platykurtic. While relatively little change was noted, pre to post, in the performance of high-scoring pupils, a marked change was noted in the performance of pupils who had achieved a low grade equivalent score on the pre-test.

CONCLUSIONS

At the present time there exists a growing concern for the failure of so many children to learn to read adequately, as well as an increasing awareness of the crucial role of the teacher in aiding childrens' development of reading proficiency. While the training of teachers with Minicourse Eighteen will certainly not solve all of the problems of reading deficiency, the results of the present investigation appear to indicate the potential contribution of Minicourse Eighteen for increasing teachers' effectiveness in teaching reading decoding skills. The results of the investigation also suggest that the training of teachers with Minicourse Eighteen may result in significant pupil growth in reading decoding skills.

Teacher Behavior

The findings of the teacher behavior phase of the study indicate that, for the panels of teachers studied, training with Minicourse Eighteen was a significant contributor to the development and refinement of behaviors related to teaching reading decoding skills. As was noted in studies of previously introduced minicourses, the training with Minicourse Eighteen also appears to have provided teachers with a more systematic approach to teaching; in this case, the teaching of reading decoding skills.

Because the training was focused upon the development of specific teaching behaviors, teachers at different grade levels, using different instructional materials, were apparently able to adapt the teaching behaviors learned in Minicourse Eighteen to their individual teaching situation. This conclusion is based not only upon the quantitative data col-

lected in the study, but also upon participating teachers' statements concerning the effects of the training upon their teaching behavior.

The fact that the training appeared to have greater effect upon the behavior of preservice teachers studied may be the result of several factors. It is generally assumed that, because of their lack of experience, preservice teachers have not developed well-defined teaching strategies. They would, therefore, be expected to be more susceptible to the type of specific training provided in Minicourse Eighteen. In-service teachers, on the other hand, would first need to recognize the extent to which the teaching behaviors which they have developed through experience are discrepent from the new behaviors to be learned. They would also need to be willing to alter their behavior to meet the new expectations. The training of in-service teachers would, therefore, seem to necessitate a greater degree of unlearning of previously used behaviors, while preservice teachers would have few previously established teaching behaviors to unlearn.

Although the experimenter had no direct role in the evaluation of the preservice teachers studied, it is possible that these teachers in-training perceived that they were being evaluated in some manner on the basis of their pre- and post-course lessons. If this were the case, the preservice teachers studied would perhaps have had greater externally-generated motivation to acquire the teaching behaviors included in the training than would in-service teachers. While the experimenter can only speculate on the validity of this point, it is felt that the most important issue is that the teaching behavior of the preservice teachers who received the training did, in fact, change in the expected direction. If the type of external motivation described above was in operation for the

preservice teachers studied, it is equally possible that such a factor could similarly affect the acquisition of teaching behavior by other groups of preservice teachers.

The means of assessing the effects of the training of the preservice teachers studied was the rating of pre- and post-course lesson videotapes. And, while the same means of assessment was also applied in the comparison of the two groups of in-service teachers, the additional criterion of pupil performance was also employed.

Pupil Performance

The finding that the performance on reading decoding tasks of pupils in the classes of in-service teachers trained with Minicourse Eighteen was superior to the performance of pupils in the classes of in-service teachers who did not receive the training is viewed as a significant result. Particularly if similar results are obtained from the study of other populations of teachers and pupils, this finding could indicate that the training and subsequent use of the teaching behaviors included in Minicourse Eighteen by primary grade teachers results in significant pupil growth in reading decoding skill.

RECOMMENDATIONS

The recommendations presented below are based upon the findings of the study and upon the review of related research.

It is recommended that:

1. Teacher-training programs at the in-service and preservice level include strategies designed to develop specific teaching behaviors.

2. The inclusion of specific teaching behaviors in a teacher-training strategy be based upon studies of the effects of teachers' use of the behaviors on pupil performance.
3. Where feasible, training in the use of specific teaching behaviors include the use of symbolic and perceptual modeling, microteaching, and videotape feedback.
4. Individuals responsible for the training of in-service and preservice teachers in the area of reading consider the inclusion of Minicourse Eighteen as part of the overall teacher education program.

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APPENDIXES

APPENDIX A

PRE-AND POST-COURSE LESSON INSTRUCTIONS

PRE-COURSE LESSON INSTRUCTIONS

Plan a lesson of 20-30 minutes in length. It should include 5-7 minutes of activity on each of the four sections described below. It is understood that these sections probably would not be part of a regular, daily reading lesson. But, in order to cover a wide range of decoding skills, it is necessary to ask you to conduct this type of comprehensive learning experience.

Choose three children to work with you. Regardless of the grade level at which you work, plan to use pupils who represent about the middle level in your class. It is important that you use children who are not expert readers, but they should have some reading skills.

The four parts of the lesson and the content to be included are:

1. Teach the pupils to recognize two of the following lower case letters: a, b, d, g, p, q.

2. Teach the letter-sound correspondences for the following letters and groups of letters: b, c, bl, sh.

3. Teach the pupils to decode the following words:

cat	kit	bite
mane	going	hat
bit	walked	kite
unbutton	man	

4. Have the pupils arrange these words into a sentence. Then use the sentence to build decoding skills: and, same, the, Mary, book, Bill, read.

POST-COURSE LESSON INSTRUCTIONS

Plan a lesson 20-30 minutes in length. It should include 5-7 minutes of activity on each of the four sections described below. It is understood that these sections probably would not be part of regular, daily reading lesson. But in order to cover a wide range of decoding skills, it is necessary to ask you to conduct this type of comprehensive learning experience.

Choose three children to work with you. Regardless of the grade level at which you work, plan to use pupils who represent about the middle level of your class in reading skill. Do not use the top or the bottom three pupils in your class. It is important that you use children who are not expert readers, but they should have some reading skills.

The four parts of the lesson and the content to be included are:

1. Teach the pupils to recognize two of the following lower case letters: h, k, m, n, r, u.

2. Teach the letter-sound correspondences of the following letters and groups of letters: m, g, st, ch.

3. Teach the pupils to read the following words:

mat	rid	hide
cane	jumping	fat
hid	folded	ride
redo	can	

4. Have the pupils arrange these words into a sentence. Then use the sentence to build decoding skills: pillow, the, he, tear, on, saw, a.

APPENDIX B

TEACHER BEHAVIORS RELATED TO TEACHING READING DECODING SKILLS

TEACHER BEHAVIORS RELATED TO READING READING DECODING SKILLS[1]

I. GRAPHEME RECOGNITION

1. Ask pupil to match letter with same letter
2. Ask pupil to describe how two letters differ
3. Ask pupil to find same letter in word
4. Ask pupil to tell where letter is in word

II. GRAPHEME/PHONEME CORRESPONDENCE

5. Pronounce and show word to illustrate correspondence
6. Write and pronounce word pupil suggested
7. Present word examples for more than one sound of letter

III. LARGER LETTER UNITS

8. Present similar spelling pattern words together
9. Ask pupil to identify similar spelling pattern
10. Present contrasting spelling pattern words together
11. Ask pupil to identify contrasting spelling pattern
12. Present words with affixes sequentially
13. Discuss how affix changes word meaning

IV. CONTEXTUAL CLUES

14. Ask pupil to arrange words into sentence
15. Ask or tell about homograph duality

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[1]Behaviors identified through research by the Far West Laboratory.

V. TEACHING FOR TRANSFER

16. Ask why or how pupil knew

17. Provide new word differing from previously presented word in only one letter

18. Provide new word containing pattern resembling previously presented word

VI. RESPONSE TO ERROR

19. Return to previously presented word

20. Write pupil response; compare with target word

21. Ignore error

22. Move to another pupil for answer

23. Provide answer without allowing continued pupil trial

VII. NEGATIVE BEHAVIORS

24. Say "Sound letter makes," or "Sound letter says"

25. Pronounce isolated letter sound

26. Ask pupil to pronounce isolated letter sound

27. Pronounce word with unnatural stress

APPENDIX C

DIRECTIONS FOR ADMINISTERING MINICOURSE EIGHTEEN ACHIEVEMENT TEST: PRE-AND POST-TEST FORMS

MINICOURSE EIGHTEEN ACHIEVEMENT TEST:
PRE-TEST

PART I

1. Copy the first row of the test on the chalkboard. Display upper and lower case alphabets near the chalkboard.

2. Have a letter frame ready.

3. Give each pupil the test sheet with his name on it, a crayon, and a marker.

4. Say "These letters on the chalkboard are just like the letters on the top row of your paper. Put your marker under the first row. I will hold this frame around one of the letters on this chart." (Frame E). "Find this letter in Row 1 and make a mark on it like this." Demonstrate on the chalkboard. Check to see that each pupil has marked E.

5. Say "Move your marker down one row. In Row 2, make a mark on this letter." (Frame B). Continue with similar directions for Rows 3-5.

   Row 3. Frame F
   Row 4. Frame g
   Row 5. Frame w

6. Say "Put your marker under the next row, Row 6. In this row, mark the letter that is <u>different</u>. Check to see that all have marked O. If some were incorrect, say "<u>Different</u> means not the <u>same</u>."

7. Say "Move your marker down. In Row 7, mark the letter that is different."

8. In Row 8, mark the letter that is different.

9. In Row 9, mark the letter that is different.

10. In Row 10, mark the letter that is different.

11. Say "Look at the words in Row 11. All three of the words have the same letter. Mark the letter that is the same." Check to see that all have marked the correct letter.

12. Say: Mark the letter in each word in Row 12 that is alike.

13. Say: Mark the letter in each word in Row 13 that is alike.

14. Frame the letter "g" and say "Mark this letter in each word in Row 14."

15. Frame the letter "n" and say "Mark this letter in each word in Row 15."

PART II

1. Say: "Put your marker under Row 1. Look at the letters in that row. Mark the letter that is at the beginning of the words I say. Back, Big, Bit." Check to see that all have marked this row correctly.

2. Say "Move your marker down under Row 2. Look at the letters in that row. Mark the letter that is at the beginning of these words, Map, Metal, Must."

3. "Mark the letter in Row 3 that is at the beginning of these words: nap, neck, nut."

4. "In Row 4, mark the letter that is at the end of these words: bat, cut, net."

5. "In Row 5, mark the letter that is at the end of words: bid, fed, mud."

6. "Move your marker under Row 6. Mark the letter at the beginning of these: cabin, come, cotton."

7. "In Row 7, mark the letter that is at the beginning of these words: cent, city, certain."

8. "In Row 8, mark the letter that is at the beginning of these words: get, give, gum."

9. "In Row 9, mark the letter that is at the beginning of these words: gem, gentle, ginger."

10. Put your marker under Row 10. Mark the two letters that are at the beginning of these words: stab, star, stem. Check to see that all have marked st.

11. In Row 11, mark the two letters at the beginning of these words: travel, truck, train.

12. In Row 12, mark the two letters at the beginning of these words: black, bled, blow.

13. In Row 13, mark the two letters at the end of these words: band, friend, around.

14. In Row 14, mark the two letters at the end of these words: almost, best, last.

15. Move to Row 15. Listen to these words: think, thing, thumb. Mark the letters that stand for the first sound in those words.

16. In Row 16, mark the letters that stand for the first sound in shell, shop, shut.

17. In Row 17, mark the last letter in dish, wash, brush.

18. In Row 18, mark the first letters in chair, chicken, chop.

19. In Row 19, mark the last letters in march, rich, such.

PART III

1. Say: Put your marker under Row 1. I will write a word on the board. (Write Fill). This is the word Fill. Now find the word Mill in Row 1 and draw a line under it. Mill.

2. Move your marker under Row 2. Watch the word I write on the board. (Write send). This is the word send. Find the word lend and draw a line under it. Lend.

3. Row 3. (Write Hat). This is the word Hat, find the word bad and draw a line under it. Bad.

4. Rwo 4. (Write can). This is the word can, find the word cat and draw a line around it. Cat.

5. In Row 5, draw a circle around the two words that are most like these two words. (Write mat on the board). These words are mat and mate. Mate.

6. Row 6. Draw a circle around the two words that are most like these two words. (Write bit, bite on the board).

7. In Row 7. There are three endings which some words can have. Here is the word talk. (Write talk on the board). Draw a line under every ending that talk can have in Row 7.

8. In Row 8, draw a line under the endings that this word (Write Cat) can have.

PART IV

1. At the top of your paper, there are six words with dotted lines between them. I will read them to you. Make a sentence out of these six words and write it on line 1. Be sure to use only these six words.

2. Move down to Row 2. In the sentence you wrote in Row 1, look at the word girl. Draw a line under the word in Row 2 that you could put in place of girl. The words in Row 2 are gib, over, cat, and sun.

3. In box 3 are 3 lines of words. Draw a line under the lines of words that tell about this word. (Write "wind" on the board). I will read the lines of words for you." (Do not read Wind).

4. In Row 4 there are three lines of words. Draw a line under the lines of words that tell about this word. (Write bow on the chalkboard). I will read the lines of words for you. (Do not read bow).

MINICOURSE EIGHTEEN ACHIEVEMENT TEST:
POST-TEST

PART I

1. Copy the first row of the test on the chalkboard. Display upper and lower case alphabets near the chalkboard.

2. Have a letter frame ready.

3. Give each pupil the test sheet with his name on it, a crayon, and a marker.

4. Say "These letters on the chalkboard are just like the letters on the top row of your paper. Put your marker under the first row. I will hold this frame around one of the letters on this chart." (Frame L). "Find this letter in Row 1 and make a mark on it like this." Demonstrate on the chalkboard. Check to see that each pupil has marked L.

5. Say "Move your marker down one row. In Row 2, make a mark on this letter." (Frame H). Continue with similar directions for Rows 3-5.

   Row 3. Frame B
   Row 4. Frame b
   Row 5. Frame k

6. Say "Put your marker under the next row, Row 6. In this row, mark the letter that is <u>different</u>." Check to see that all have marked S. If some were incorrect, say "<u>Different</u> means <u>not the same</u>."

7. Say "Move your marker down. In Row 7, mark the letter that is <u>different</u>."

8. In Row 8, mark the letter that is <u>different</u>.

9. In Row 9, mark the letter that is <u>different</u>.

10. In Row 10, mark the letter that is <u>different</u>.

11. Say "Look at the words in Row 11. All three of the words have the same letter. Mark the letter that is the same." Check to see that all have marked the correct letter.

12. "Mark the letter in each word in Row 12 that is alike."

13. "Mark the letter in each word in Row 13 that is alike."

14. "Mark the letter in each word in Row 14 that is alike."

15. Frame the letter "p" and say "Mark this letter in each word in Row 15."

PART II

1. Say: "Put your marker under Row 1. Look at the letters in that row. Mark the letter that is at the beginning of the words I say. but, bed, begin." Check to see that all have marked this row correctly.

2. "Move your marker down under Row 2. Look at the letters in that row. Mark the letter that is at the beginning of these words: man, met, milk."

3. "Mark the letter in Row 3 that is at the beginning of these words: nest, not, number."

4. "In Row 4, mark the letter that is at the end of these words: at, bit, get."

5. "In Row 5, mark the letter that is at the end of these words: had, led, odd."

6. "Move your marker under Row 6. Mark the letter at the beginning of these words: camel, color, cost."

7. "In Row 7, mark the letter that is at the beginning of these words: cement, center, circle."

8. "In Row 8, mark the letter that is at the beginning of these words: got, gallop, girl."

9. "In Row 9, mark the letter that is at the beginning of these words: general, giant, German."

10. "Put your marker under Row 10. Mark the two letters that are at the beginning of these words: store, step, stop." Check to see that all have marked st.

11. "In Row 11, mark the two letters at the beginning of these words: track, trip, trot."

12. "In Row 12, mark the two letters at the beginning of these words: blanket, block, blue."

13. "Row 13, mark the two letters at the end of these words: and, bend, find."

14. "Row 14, mark the two letters at the end of these words: most, rest, first."

15. "Row 15, listen to these words: thank, thick, thirty. Mark the letters that stand for the first sound in those words."

16. "In Row 16, mark the letters that stand for the first sound in shall, shed, ship."

17. "In Row 17, mark the last letters in crash, fish, fresh."

18. "In Row 18, mark the first letters in chalk, chat, chin."

19. "In Row 19, mark the last letters in which, church, much."

PART III

1. Say: "Put your marker under Row 1. I will write a word on the board." (Write hill). "This is the word hill. Now find the word bill in Row 1 and draw a line under it. bill."

2. "Move your marker under Row 2. Watch the word I write on the board." (Write find). "This is the word find, find the word kind and draw a line under it. Kind."

3. "Row 3." (Write mat). "This is the word mat, find the word man and draw a line under it. man."

4. "Row 4." (Write ran). "This is the word ran, find the word rat and draw a line around it. rat."

5. "In Row 5, draw a circle around the two words that are most like these two words." (Write mat on the board). "These words are mat and mate." mate

6. "Row 6. Draw a circle around the two words that are most like these two words." (Write sit on the chalkboard).
site

7. "In Row 7, there are three endings which some words can have. Here is the word send." (Write send on the board). "Draw a line under every ending that send can have in Row 7."

8. "In Row 8, draw a line under the endings that this word" (write dog,) dog can have."

PART IV

1. "At the top of your paper, there are six words with dotted lines between them. I will read them to you." "Make a sentence out of these six words and write it on line 1. Be sure to use only these six words." (Wait until all have finished before moving on to #2).

2. "Move your marker down to Row 2. In the sentence you wrote in Row 1 look at the word boy. Draw a line under the word in Row 2 that you could put in place of boy. The words in Row 2 are of, around, dog, tree."

3. "In Row 3, there are three phrases. Draw a line under the phrases that tell about this word." (Write lead on the board.) "I will read the phrases for you." (Do not read lead.)

4. "In Row 4, there are three phrases. Draw a line under the phrases that tell about this word." (Write close on the board.) "I will read the phrases for you." (Do not read close.)

APPENDIX D

INTERCORRELATIONS BETWEEN SUBTEST SCORES:
MINICOURSE EIGHTEEN ACHIEVEMENT TEST

INTERCORRELATIONS BETWEEN PRE- AND POST-SUBTEST SCORES FOR ALL SUBJECTS (N=230): MINICOURSE EIGHTEEN ACHIEVEMENT TEST

	PRE I	PRE II	PRE III	PRE IV	POST I	POST II	POST III	POST IV
PRE I	1.00							
PRE II	.37	1.00						
PRE III	.19	.56	1.00					
PRE IV	.19	.38	.43	1.00				
POST I	.33	.32	.17	.23	1.00			
POST II	.26	.67	.41	.40	.29	1.00		
POST III	.13	.27	.34	.43	.18	.41	1.00	
POST IV	.22	.34	.37	.39	.26	.28	.40	1.00

I - Grapheme Recognition

II - Grapheme/Phoneme Correspondence

III - Spelling Patterns

IV - Contextual Clues